

Mindarie

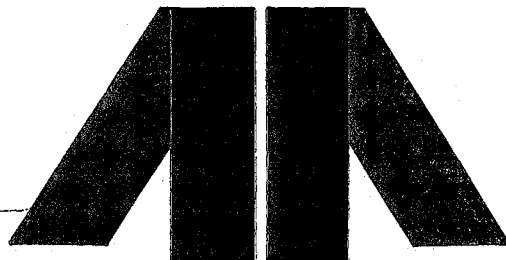
Environmental City

Mindarie

Environmental City

Interim Development Report

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MINDARIE ENVIRONMENTAL CITY -
THE INTERIM DEVELOPMENT PLAN

The second of a series prepared for
Development Underwriting Pty Ltd and
Mindarie Property Company Pty Ltd by

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Introduction

MINDARIE ENVIRONMENTAL CITY

THE INTERIM DEVELOPMENT PLAN

INTRODUCTION

This report is the second in a series commissioned by Mindarie Property Company Pty Ltd to investigate the potential for, and guide the establishment of, a development of outstanding character at Mindarie Environmental City.

Mindarie Environmental City is a major development project, north of Perth, Western Australia, situated in the north west corridor of the Metropolitan Region.

From its inception the Mindarie concept has been of an area planned in harmony with its surroundings, providing high environmental quality for its inhabitants, both in environmental and socio-economic terms.

An initial report, entitled "Mindarie Environmental City" was published in 1973. It comprised an in-depth assessment of the land and identified constraints and opportunities inherent in its geomorphological and biological systems. Areas were suggested as suitable for a range of human uses broadly categorised as urbanisation, recreation and conservation. A preliminary land use or "structure plan" was produced.

The purpose of the present report is to:

- establish the role and broad development potentials of Mindarie in the context of the Metropolitan Region and the north west corridor
- define goals for the development of Mindarie and suggest a strategic approach to their attainment
- propose major land uses for Mindarie, their disposition and extent, with continued reference to the findings of the "Mindarie Environmental City" first report
- provide a basis for discussion with all authorities concerned, in particular, the Local Authority, the Town Planning Board, the Metropolitan Region Planning Authority and the Land and Housing Consultative Committee
- establish the framework within which an initial stage of development can begin
- provide the framework for more detailed financial assessment of the Mindarie concept

- define areas which will be of ongoing concern and which will require more intensive consideration as planning proceeds

Mindarie Environmental City is an integral part of the north west corridor and its potential for development follows naturally from growth trends already apparent. If established trends continue, there will be a potential for development at Mindarie which should see a population of over 70,000 by the turn of the century.

Several current studies are underway for public authorities which may influence planning, servicing and movement patterns in the corridor. However, most goals guiding internal development at Mindarie remain valid and our approach has been to propose solutions compatible with the goals, while taking account of possible alternative requirements.

In some cases, external proposals will not be in the best interests of Mindarie residents. For example, it would be preferable, for aesthetic, environmental and social reasons, that an extension of Mitchell Freeway should not pass through residential areas of Mindarie; the route should be outside the urban corridor.

Where appropriate, the report proposes new development concepts, in particular the idea of Community Development Associations which could take an active role in planning and operating facilities as development proceeds; combined use of public facilities by schools and other groups is also proposed in relevant areas.

The preliminary Structure Plan has been re-examined, in the light of social objectives and a more comprehensive land use, open space and movement pattern is proposed. The Interim Development Plan provides a basic framework for development over an initial five to ten year period. It locates only those fixed elements necessary to structure development, while allowing scope for changed requirements as they may occur over time.

1 Major Findings and Recommendations

1. MAJOR FINDINGS AND RECOMMENDATIONS

Mindarie Environmental City is located 30 kilometres from central Perth in the proposed north west corridor of the Metropolitan Region. It comprises 3012 hectares of land, bounded on the east by Neerabup National Park and on the west by the Indian Ocean. It is attractive land with potential for high quality residential use.

1.1 Population

- At present suburban densities, Mindarie could accommodate almost 80,000 people. Of the Perth metropolitan region, the north west sector contains the greatest population and its outer ring has continued to demonstrate high growth, even in periods of moderate expansion. In fact it is now the fastest growing area in the entire region.
- The Region experienced rapid population growth (5.2%) p.a. between 1966 and 1971. The rate of growth has declined to 2.6% since 1971 but with an average annual net migration of 16,000, growth would continue at 3.2%, giving a Metropolitan population of 1,691,700 by 2001.
- By the year 2001 the north west sector is likely to contain almost 750,000 persons, (given no artificial constraints to development), and it will continue as the most heavily populated of the four sectors.
- Initial population growth at Mindarie will be low, amounting to only 5,000 by 1981. This rate assumes growth will commence in 1977. However the population of Mindarie could reach 72,500 within 27 years, its peak growth being between 1991 and 2001.
- Mindarie is likely to attract young families throughout its development period with average income levels that are marginally higher than for the region as a whole. Social facilities distribution, land use planning and development design will be influenced accordingly.

1.2 Employment

- Service employment accounts for nearly 70% of the Region's workforce, a high proportion of it located in the Central Business District.
- Growth in the categories of finance, public administration and wholesale and retail trade has been at a rapid rate and service industry is likely to continue to dominate regional employment

- While manufacturing employment in the Region is increasing overall, its percentage share of total employment has declined.
- Almost 60% of all regional jobs are located in the north west sector (which includes the CBD). The sector contains 38% of all basic and 66% of all service employment.
- The greatest percentage of white collar employees live in the north west sector. It is likely that the north west sector will continue to attract a high proportion of service employees and to provide them with both home and workplace.
- At present, an estimated 10,450 workers live within the Shire of Wanneroo. Job opportunities are few, but as growth occurs, demand for local employment will grow.
- A high proportion of job opportunities in Wanneroo will be provided in meeting the needs of the local population. By 2001 it is estimated that over 33,000 jobs will be available in Wanneroo in retail, educational, health, professional and community services alone. Of these, 8,000 jobs could be at Mindarie.
- Manufacturing employment, possibly in conjunction with major industrial development, could be attracted to the north west. In any event, the construction industry would provide substantial employment at Mindarie over its 25 year growth period.
- It is proposed that an Industrial Park be developed at Mindarie and it is expected that local employment will be generated with the growth of retail, commercial and community activity.

1.3 Residential Development

- Housing completions in the Perth Region rose rapidly during the period of maximum population growth, but tended to lag behind demand. This disparity has been remedied since 1971, with housing completions growing rapidly relative to population growth.
- The north west sector captured 45 percent of all new dwelling units constructed in the region between 1961-1973.
- The Shire of Wanneroo has had the highest average annual growth rate in housing completions in the Region since 1966. Since 1971, it has accounted for 55 percent of all housing completions in the north west sector and 25 percent of all new units in the Perth Region.

- In view of the quantity of high quality building land still vacant within the Shire, it is predicted that these trends will continue and that a significant proportion of demand for new dwelling units will occur in Wanneroo. It is likely that Mindarie will contain in the vicinity of 25,000 dwellings by the year 2001.
- Current net residential densities (8-10 dwellings per hectare) are likely to prevail at Mindarie, and single family dwellings are likely to predominate. Residential development will form the largest single land use.
- However, market preferences may vary over the period of development and a wide range of housing types and densities may be included.
- To achieve variety, it may be desirable for development to be farmed out to several development companies and the State Housing Commission on condition that they fulfil standards established as a result of the Interim Development Plan.

1.4 Movement

- In 1971, 95.5% of households in the Shire of Wanneroo owned one or more motor vehicles. If ownership rates are as projected by the PERTS study, the number of private vehicles in the north west sector in 1986 will be 245,000. Car ownership and personal mobility at Mindarie is expected to be high.
- In 1971, more than 70% of journeys to work in the north west sector were along a north-south axis. Workers at Mindarie will generate a similar commuting pattern. The need will exist for a regional north-south movement axis capable of handling large volumes of public and private transport.
- Other major movements, particularly for shopping, will be along a similar axis. By 1989, PERTS projects a three-fold increase in the number of vehicle trips in the Region for all purposes.
- Movement patterns at Mindarie may be regarded as a hierarchical system, the primary routes being established within the context of the north west corridor. Secondary routes will provide for main internal movement, including bus services, while skirting traffic-free "environmental areas".
- Within Mindarie, peak movements will be journeys to school and local employment. Of all future journeys 85% will have the home as origin or destination.

- Public transport, pedestrian and bikeways will be important means of movement for students and young shoppers. However, at least 66% of local shopping trips could be made by car.
- Local and regional public transport is proposed in accordance with criteria set out by the Metropolitan Transport Trust. The local bus system will remain efficient even if future regional movement is undertaken by other means, such as a fixed-rail system.

1.5 Retail Potentials

- The viability of shopping facilities will depend on population, income and expenditure patterns, location, the drawing power of the principal tenant and the surrounding competition.
- Large, regional centres have begun, in recent years to capture an increasing share of metropolitan comparison sales. This trend is likely to increase in importance as development spreads further from the CBD.
- It is anticipated that Mindarie will be able to support a major shopping complex and several neighbourhood centres.
- It is recommended that community facilities such as nurseries, churches, community halls, health clinics and libraries be integrated with shopping facilities to provide opportunities for social interaction and community development.
- The Town Centre should be developed in stages as warranted by population and residential development. Preliminary designs suggest a flexible approach which would permit it to begin as a neighbourhood centre and expand gradually to the role of Town Centre.

1.6 Social Environment

- The development of Mindarie will be based on the co-ordination of physical criteria with social needs.
- Efforts will be made to ensure that essential facilities (such as doctors surgery, food stores, chemist, etc.) are provided early in the development, that local residents are involved in community management and development, that the community is balanced by age and socio-economic status, and that public and private transport facilities are available.
- A range of education facilities will be provided for at Mindarie, including pre-school, primary, secondary, tertiary, technical and special education

activities. Dual use of appropriate community facilities by schools and other groups will be encouraged, to maximise social and economic investments.

- Commercial facilities will be designed to meet both material and social needs and will be provided in response to local demand.
- Churches will be encouraged to establish at local activity centres and sites will be reserved in consultation with interested church authorities.
- A comprehensive range of medical, dental and welfare services will be encouraged to locate at Mindarie. These will be situated in local activity centres and residential areas. Provision will be made for private hospitals and homes for aged persons as the demand arises. It is expected that a public hospital will be constructed at Lake Joondalup.
- It is recommended that Community Development Associations be established at Mindarie in view of the benefits they can provide to their members, the developer and the Local Authority.

1.7 Recreation and Open Space

- Public demand for recreation facilities is growing, in response to increased leisure time and other factors.
- The planning and management of recreation resources at Mindarie will aim to ensure variety between active and passive activities, that facilities are easily accessible, and that maximum use will be made of the facilities provided.
- Recreation potentials are examined in relation to the anticipated needs of the local population (children, adolescents, families and elderly persons). These needs are then related to the provision of facilities such as playlots, playgrounds, parks, sports and community centres.
- Open space at Mindarie will be divided into three basic categories, viz, land left in its natural state, landscaped areas, and land for sportsgrounds and club activities, in accordance with the Mindarie Environmental Study.
- Quantitative standards for open space, based on population catchments, have been suggested for application to Mindarie so that provision can be related to community needs. The overall percentage of land given over to open space will be within Town Planning Board requirements.

1.8 Public Utilities

- Water supplies will be obtained from local aquifers in the early stages of development while long term supplies will probably be obtained from the Ghangara Mound.
- Temporary sewerage plants will be required to service the initial development. A permanent Sewerage Treatment Plant will be required and alternative locations have been suggested at Beenypur or within Mindarie.
- Drainage problems are not anticipated in view of the prevailing soil conditions. Sumps will be needed for the disposal of stormwater.
- Electricity supplies from existing sources will be able to meet the potential demand. A regional zone substation will eventually be required at Mindarie to maintain the quality of service. It is recommended that underground reticulation be investigated.

2 Corridor Strategy

2. CORRIDOR STRATEGY

2.1 Principles

The concept of corridor planning as derived for Perth provides for linear development in clearly defined "fingers" emanating from an established urban core at the heart of which is the Central Business District. "Sub-regional" centres are encouraged to locate at strategic points within the corridor while wedges of open space and non-urban land uses separate the various corridors. The transportation system is used as an axis of development and, in effect, structures both the location and form of urban growth.

2.2 The Corridor Plan for Perth

The Corridor Plan for Perth* was published in 1970 by the Metropolitan Region Planning Authority and confirmed by Cabinet in 1973.

Four corridors have been delineated:

- the north west corridor extending from Perth to Yanchep and Moore River
- The eastern corridor extending from Perth to the Darling Ranges
- the south eastern corridor extending from Perth to Armadale and beyond
- the south western corridor extending from Perth to Rockingham and eventually to Bunbury.

The corridors, as defined in Fig. 1 are between five and eight kilometres wide.

Key Elements

Open Space:

Wedges of open space between the urban corridors have been reserved for such uses as national parks, market gardens, orchards as well as other agricultural, institutional and special uses. Fig. 1 indicates these uses.

Sub-Regional Centres:

The Plan recommends that centres be established within each corridor to provide services and employment for persons living close to them. It is envisaged that many of the functions previously reserved for the central

* The Corridor Plan for Perth MRPA Perth WA 1970

ROCKINGHAM

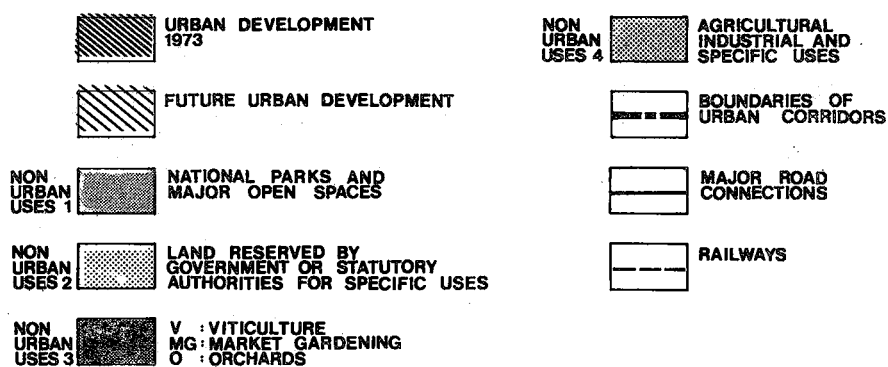


Fig. 1

business district will be able to be fulfilled at these centres. Early development of centres at Fremantle and Midland has been proposed while Lake Joondalup, Armadale and Rockingham are seen as future concentrations.

Transport Facilities:

The development of transport links is a key element in the corridor strategy. These are based on the construction of major road networks (eventually to freeway standard) through each corridor. The plan anticipates that the car and bus will continue as the major forms of urban transport.

Public Utilities:

The progressive extension of the main services (including water supplies, sewerage drainage and electricity) along the corridor is foreseen.

2.3 The North West Corridor

The north west corridor is proposed to extend from Perth along the coast 50 km to Yanchep and beyond. It is anticipated that it will gradually grow towards a possible new port facility at Moore River. Population projections by the Metropolitan Region Planning Authority in 1970 anticipated 185,000 people living in this corridor by 1989.

Ownership Pattern

The undeveloped land (extending basically from Mullaloo to Yanchep) is mainly in large, privately owned holdings. Development has already commenced at Ocean Reef, Quinns Rock and Yanchep. Fig. 2 shows the major development areas.

Development Strategy

A co-ordinated land use and transportation plan is essential for development in the corridor to proceed smoothly.









Land Use:

The expected population growth in the corridor will require substantial provision for housing, employment, shopping facilities, recreation outlets and community services.

Several potential development areas could expand within the corridor (based on present ownership boundaries) forming individual communities.

Ideally, proposals for the development of major projects such as industrial areas, shopping centres, open space, recreation areas and community facilities would be assessed

PROPOSED NORTH - WEST CORRIDOR

- | | | | |
|---|-----------------------------|---|--------------------|
|  | URBAN |  | PARKS & RECREATION |
|  | URBAN DEFERRED |  | STATE FOREST |
|  | PERTH C.B.D. |  | INDUSTRIAL ZONES |
|  | MINDARIE ENVIRONMENTAL CITY |  | ACTIVITY CENTRES |

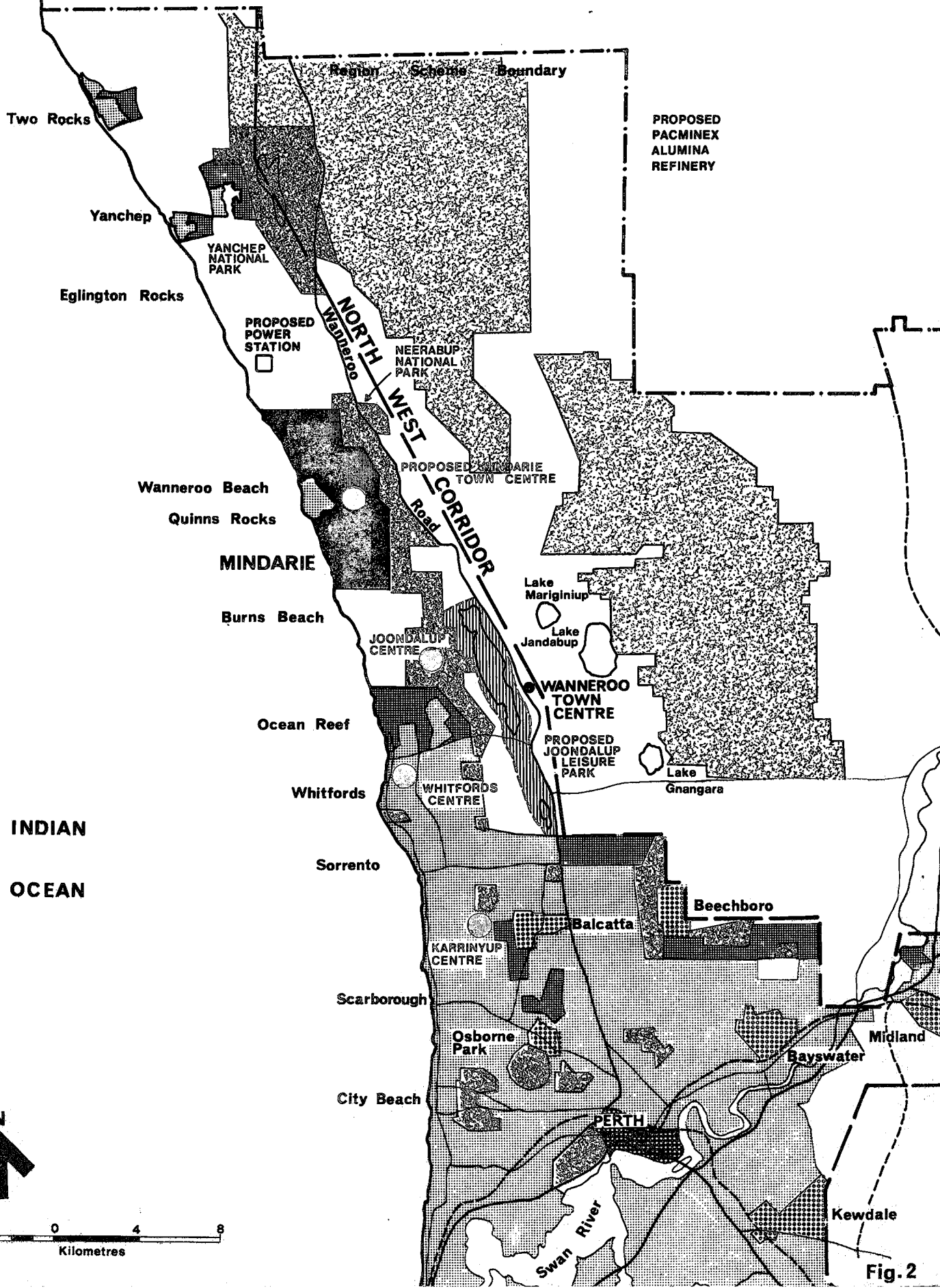


Fig. 2

within an overall strategy for the north west corridor. This must be developed at an early stage so that servicing and access problems can be resolved.

Transportation Policy:

The projected growth of the north west corridor will require the construction of a major road network to connect it with Perth. It would be logical for it to be built, prior to, or in conjunction with, large scale development, since the location of the major roads will be crucial to the planning and growth of major facilities, particularly shopping and commercial centres, recreation centres and education facilities.

2.4 The Role of Mindarie in the North West Corridor

Mindarie is located 30 kilometres of the Perth central business district. It comprises 3012 hectares of land and could eventually accommodate in the vicinity of 80,000 people at current residential densities in a variety of lifestyles and occupations.

The north west corridor is growing rapidly and urban development is occurring within six kilometres of Mindarie at Ocean Reef and Whitfords. Development is also taking place at Two Rocks and Yanchep, some 10-15 kilometres north of Mindarie.

Because of its size and its location, Mindarie Environmental City has the potential to play a major role in the development of the corridor. It is intended to provide a town centre and associated community facilities, a broad range of recreational outlets and employment opportunities.

A high standard of development is proposed which will retain as far as possible the natural features of the area. Environmental constraints and initial planning proposals are documented in the first planning report entitled Mindarie Environmental City*.

* USC, June 1973

3 Demographic Trends

3. DEMOGRAPHIC TRENDS

3.1 Western Australia

During the 1960s, Western Australia experienced rapid population growth. This was particularly evident from 1966-1971 when the total population increased from 848,100 to 1,030,469. A high proportion of the total increase was due to immigration which came in the wake of the mining boom. Table 1 indicates the major trends since 1965 and separates the increases into "natural increase" and "estimated net migration". After 1971, immigration declined dramatically, partly due to government policy and partly due to changed economic conditions.

TABLE 1

DEMOGRAPHIC TRENDS
WESTERN AUSTRALIA
1965-1973

YEAR	POPULATION	NATURAL INCREASE	ESTIMATED NET MIGRATION	TOTAL INCREASE
1965	825,525	9,825	6,987	16,812
1966	848,100	9,878	12,491	22,369
1967	876,362	11,058	17,204	28,262
1968	909,409	11,525	21,522	33,047
1969	954,846	12,712	27,092	39,809
1970	991,354	13,683	22,825	36,508
1971	1,030,469	15,476	23,639	39,115
1972	1,053,182	15,634	7,079	22,713
1973	1,068,469	13,528	1,759	15,287

Source: ABS

3.2 Perth Metropolitan Region

Population growth in the Perth Region has been significantly higher than for Western Australia as a whole. During the period 1966-1971 the Perth Region population was increasing by an average 29,000 persons per annum, while for the balance of Western Australia, population increased by 7,600 persons per annum. The increase was largely due to the high level of net immigration sustained during this period. Table 2 demonstrates these trends. It also indicates the extent of the downturn subsequent to 1971.

TABLE 2

POPULATION TRENDS
 PERTH METROPOLITAN REGION
 1954-1973

	TOTAL POPULATION				
	1954	1961	1966	1971	1973
Perth Metropolitan Region	395049	475238	558821	703199	739200
Balance of W.A.	244722	261391	289279	327270	329300
Total Western Australia	639771	736629	848100	1030469	1068500

	AVERAGE ANNUAL CHANGE							
	1954-1961		1961-1966		1966-1971		1971-1973	
	No.	%	No.	%	No.	%	No.	%
Perth Metropolitan Region	11456	2.9%	16716	3.5%	28876	5.2%	18000	2.6%
Balance of W.A.	2381	0.97%	5578	2.1%	7598	2.6%	1015	0.3%
Total Western Australia	13837	2.2%	22294	3.0%	36473	4.3%	19015	1.9%

Source: USC 1974

TABLE 3

POPULATION PROJECTIONS
PERTH METROPOLITAN REGION
1974-2001

AREA	TOTAL POPULATION						
	1974	1976	1981	1986	1991	1996	2001
Perth Metropolitan Region	762,600	802,200	932,200	1,082,200	1,257,200	1,458,400	1,691,700
Balance of Western Australia	330,300	342,300	372,300	407,300	442,300	481,800	522,800
Total Western Australia	1,092,900	1,144,500	1,304,500	1,489,500	1,699,500	1,940,200	2,214,500

AVERAGE ANNUAL POPULATION GROWTH
PERTH METROPOLITAN REGION
1974-2001

AREA	AVERAGE ANNUAL CHANGE											
	1974-1976		1976-1981		1981-1986		1986-1991		1991-1996		1996-2001	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Perth Metropolitan Region	19,800	2.6%	26,000	3.2%	30,000	3.2%	35,000	3.2%	40,200	3.2%	46,660	3.2%
Balance of Western Australia	6,000	1.8%	6,000	1.7%	7,000	1.8%	7,000	1.8%	7,900	1.8%	8,200	1.7%
Total Western Australia	25,800	2.4%	32,000	2.8%	37,000	2.8%	42,000	2.8%	48,100	2.8%	54,860	2.8%

Source: USC 1974

Population projections for the Perth Metropolitan Region (shown in Table 3) project a gradual upsurge in growth rates and anticipate that a population of 1,691,700 persons will reside in the Region by 2001. These projections could be dramatically increased in the event of a change in immigration policy and/or major industrial expansion or a renewed mineral boom. Similarly the rate of growth would be lower if there is a severe economic recession. Table 4 shows population projections based on these possibilities*.

Diagram 1 indicates the recent pattern of growth and projects likely trends. It shows the increasing dominance of the Perth Region over growth throughout the State.

3.3 Sectional Growth in the Perth Metropolitan Region

Fig. 3 divides the Perth Region into four sectors, along local authority boundaries, which include the four corridors as delineated by the Metropolitan Region Planning Authority. The Region is also divided into rings corresponding to the inner, intermediate and outer areas of Metropolitan development.

i. Population Trends

Table 5 shows population trends in the Perth Region since 1961 by local government area and by sector. The dramatic growth in the outer ring, particularly in the north west sector, is demonstrated by Diagram 2.

North West Sector:

In terms of absolute size, the north west sector contains the greatest number of people. It contains the CBD** and the older suburbs which are tending to decline in population but increase in households. By contrast the outer areas (taken as the City of Stirling and the Shire of Wanneroo) have experienced rapid growth, the latter being the fastest growing area in the Perth Region since 1971.

South West Sector:

The Shires of Cockburn, Kwinana and Rockingham experienced rapid growth between 1966-1971. Since 1971, the rate of population growth in each of these local government areas has declined significantly, reflecting the general downturn in population growth and a preference for living in other areas. This could be attributed to the barrier created by the Kwinana industrial area and the distance of the outer areas of the south west corridor from central Perth.

* All projections in the remainder of this report are based on the median figures which assume a gradual increase in the rate of growth.

** Central Business District

SECTORS AND RINGS PERTH METROPOLITAN REGION

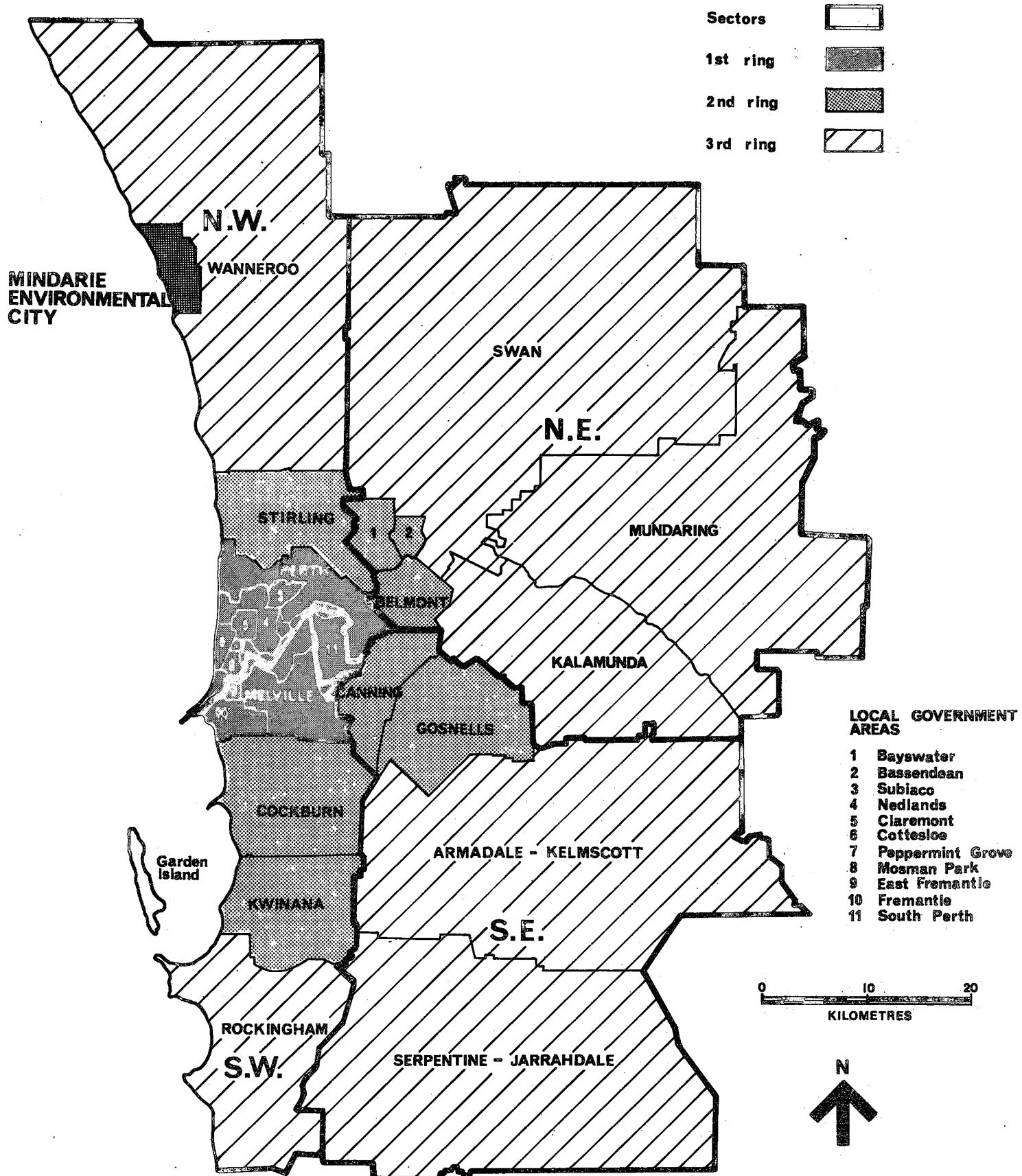


Fig. 3

TABLE 4

POPULATION PROJECTIONS
PERTH METROPOLITAN REGION
1971-2001

YEAR	PERTH METROPOLITAN REGION	BALANCE OF WA	TOTAL WA
1971 Actual	703,199	327,270	1,030,469
1981 High	1,034,100	422,400	1,456,500
Mid	932,200	372,300	1,304,500
Low	870,800	355,700	1,226,500
1991 High	1,361,600	479,200	1,840,800
Mid	1,257,200	442,300	1,699,600
Low	1,080,000	379,500	1,459,500
2001 High	1,706,600	538,900	2,245,500
Mid	1,691,700	522,800	2,214,500
Low	1,319,000	416,500	1,735,500

Low = Net natural increases only. No net migration.

Mid = Net immigration of 16,000 per year to 2001.

High = Net immigration of 23,000 per year to 2001. Average
of highest levels for 5 years 1967-1971.

Source: USC 1974

TABLE 5

POPULATION TRENDS BY SECTOR
PERTH METROPOLITAN REGION
1961-1973

SECTOR	TOTAL POPULATION				AVERAGE ANNUAL CHANGE		
	1961	1966	1971	1973a)	1961- 1966 No.	1966- 1971 No.	1971- 1973 No.
<u>NORTH WEST</u>							
Perth	94,508	96,223	97,546	94,300	343	265	-1,623
Wanneroo	1,732	2,437	8,620	23,100	141	1,236	7,240
Stirling	84,045	114,410	154,882	158,880	6,073	8,094	1,959
Subiaco	16,033	16,621	17,119	16,400	118	100	-359
Nedlands	23,218	23,320	22,878	21,900	20	-88	-489
Claremont	8,601	8,938	9,179	9,100	67	48	-40
Cottesloe	7,827	8,122	7,997	7,700	59	-25	-149
Peppermint Grove	1,502	1,601	1,511	1,500	20	-18	-6
Mosman Park	5,702	5,793	7,199	7,100	18	281	-50
Total North West	243,168	277,465	326,931	339,900	6,859	9,893	6,483
<u>SOUTH WEST</u>							
E. Fremantle	6,542	6,908	7,325	7,000	73	83	-162
Fremantle	24,343	25,284	26,036	25,300	188	150	-368
Melville	39,207	47,887	52,976	53,000	1,736	1,019	12
Cockburn	7,007	13,847	25,011	26,600	1,368	2,233	494
Kwinana	4,663	5,777	12,224	13,200	233	1,289	488
Rockingham	2,583	4,383	11,608	12,300	360	1,445	346
Total South West	84,345	104,086	135,180	137,400	3,948	6,219	1,110
<u>NORTH EAST</u>							
Belmont	20,393	26,978	32,656	32,500	1,317	1,136	-78
Bayswater	19,296	26,112	34,261	36,600	1,363	1,630	1,169
Bassendean	8,310	9,747	11,360	11,400	287	323	20
Swan	18,653	19,135	25,682	27,300	96	1,309	809
Mundaring	8,104	8,935	12,018	13,100	164	619	41
Kalamunda	7,524	9,785	18,362	20,700	452	1,715	1,169
Total North East	82,280	100,682	134,339	141,600	3,679	6,732	3,630
<u>SOUTH EAST</u>							
South Perth	29,941	32,041	31,702	30,800	42	-68	-451
Canning	17,701	23,604	35,382	38,200	1,181	2,356	1,409
Gosnells	9,504	11,374	22,040	29,000	374	2,133	3,480
Armada-le-Kelmscott	6,469	7,840	15,644	20,300	274	1,561	2,328
Serpentine							
Jarrahdale	1,830	1,728	1,981	2,000	-20	51	10
Total South East	65,445	76,588	106,749	120,300	2,229	6,033	6,776
Total	475,239	558,821	703,199	739,200	16,717	28,876	17,999

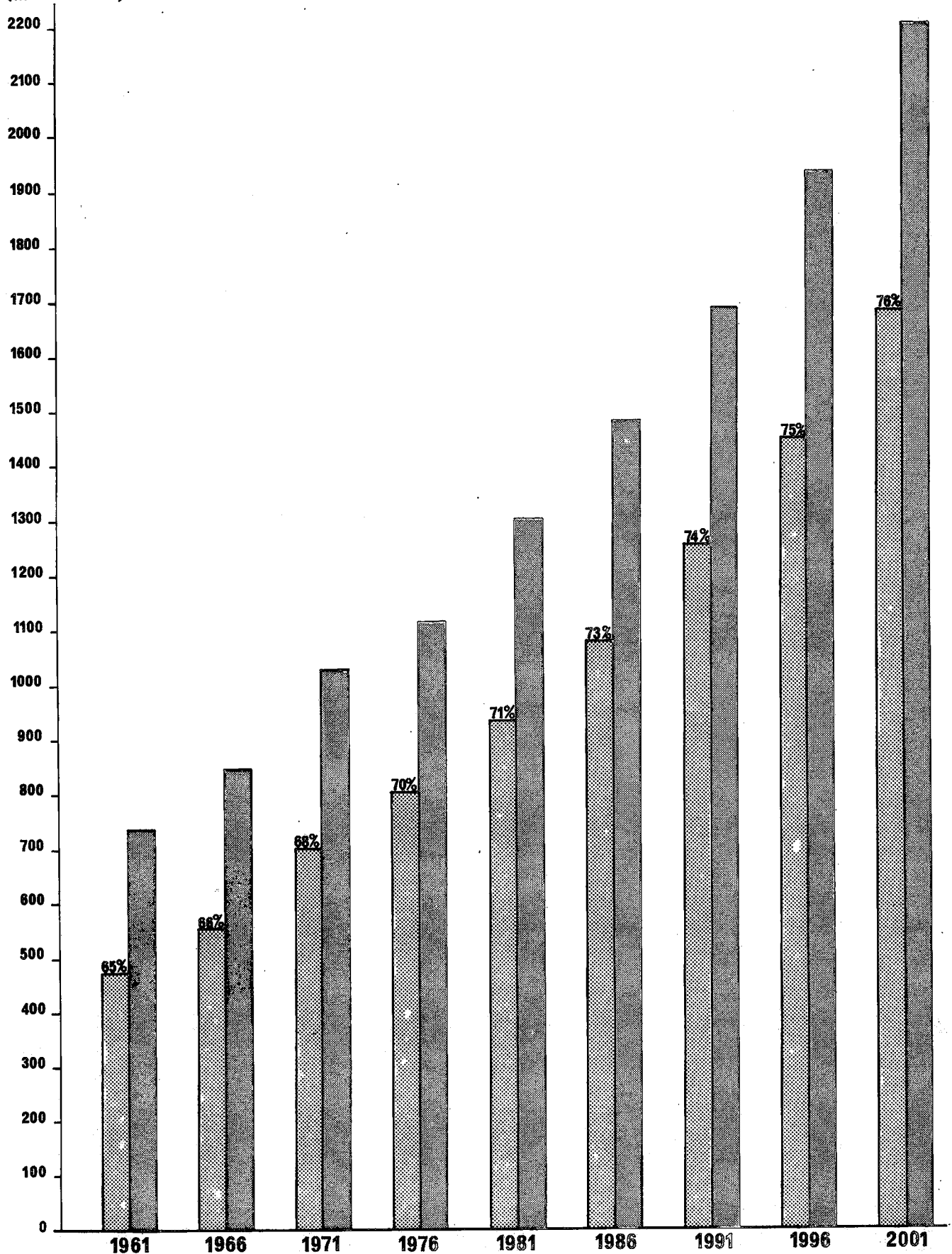
a) Estimated figure

Source: ABS, USC 1974

DIAGRAM 1
POPULATION TRENDS AND PROJECTIONS
PERTH METROPOLITAN AREA AND WESTERN AUSTRALIA
1961 - 2001

POPULATION

(in thousands)



SOURCE : A.B.S.

PERTH METROPOLITAN AREA
WESTERN AUSTRALIA

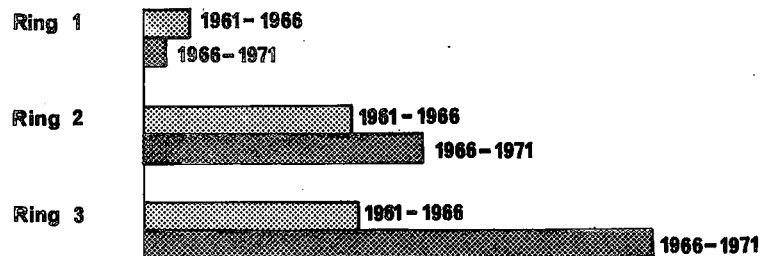
DIAGRAM. 2.
AVERAGE ANNUAL RATE OF POPULATION CHANGE BY RING SECTOR
PERTH METROPOLITAN REGION
1961 - 1971

SECTOR

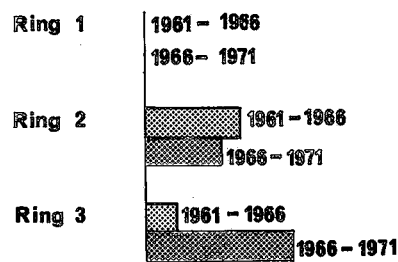
NORTHWEST



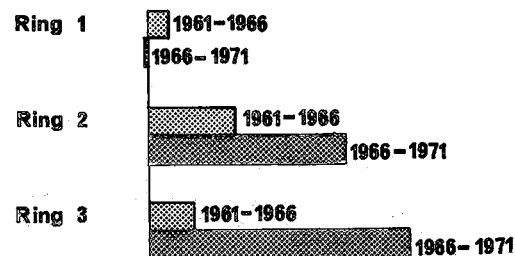
SOUTHWEST



NORTHEAST



SOUTHEAST



-5% 0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50% 55%

SOURCE : A.B.S.

U.S.C.1974.

North East Sector:

The Shires of Bayswater and Kalamunda have shown the greatest population growth in this sector. This growth was particularly marked during 1966-1971 and has continued, although at a slower rate, during the period 1971-1973.

South East Sector:

The rapid growth in population experienced in the outer areas of this sector (the Shires of Gosnells and Armadale-Kelmscott) during 1966-1971 has continued in the period 1971-1973. This is in marked contrast to all other areas in the Perth Region apart from the Shire of Wanneroo.

ii. Household Trends

Table 6 shows household trends by local government area in the Perth Region. These figures give a clearer picture of development than population figures alone. For example, while such areas as Perth, Nedlands and South Perth appear to be losing population, the number of occupied households is actually increasing, reflecting a reduction in household sizes. In the outer areas of Perth, the growth in households closely parallels population increases for the ten year period to 1971. Diagram 3 reflects these trends.

The Shire of Wanneroo with an average annual increase of 53.1 percent in households between 1966-1971, shows the greatest percentage increase in the number of households formed.

iii. Projections

Population and household projections by sector are shown in Tables 7 and 8.

North West Sector:

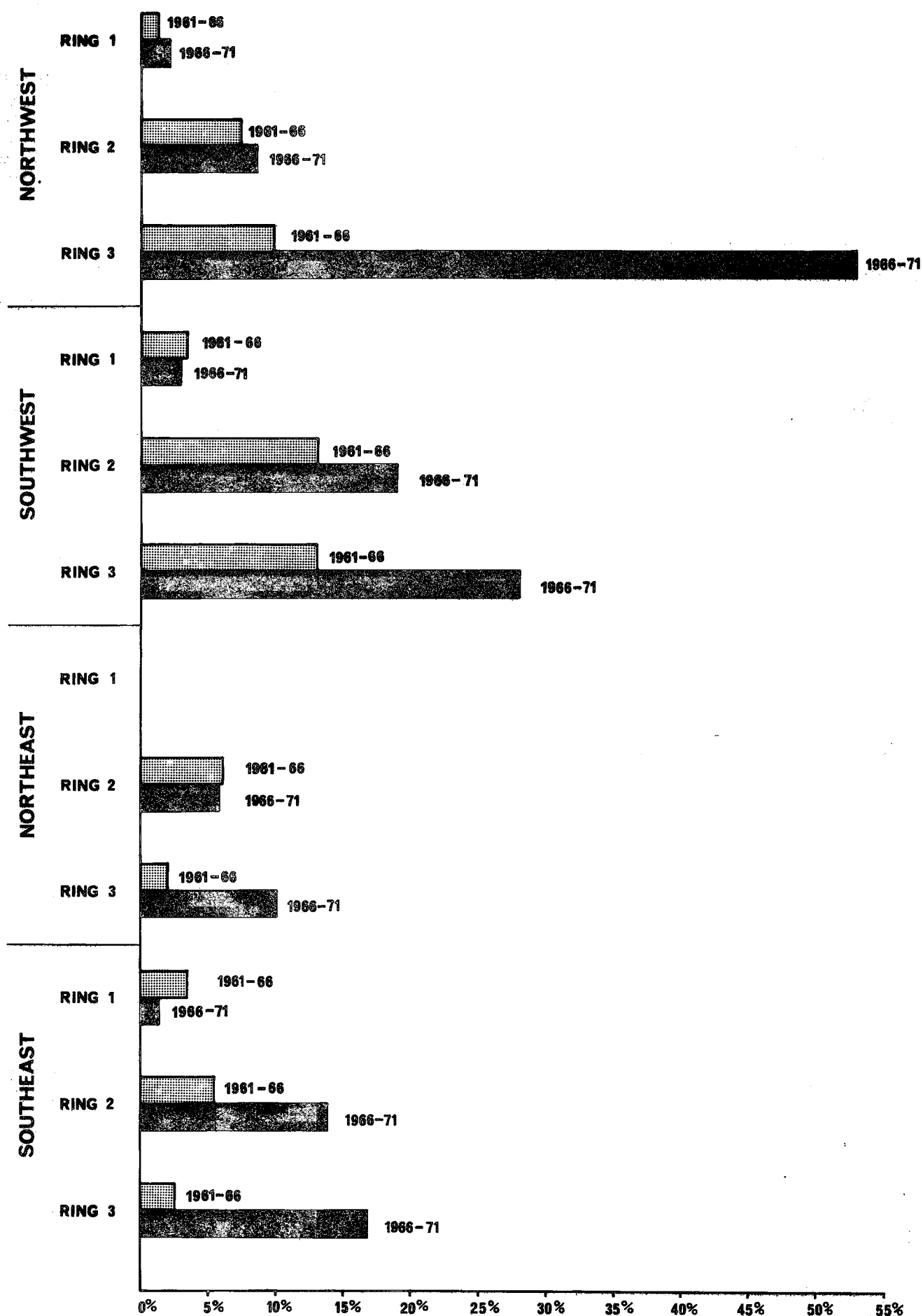
It is estimated that the north west sector will attract 747,800 persons by 2001 and will account for 44 percent of the metropolitan population. Projections show 246,000 households by 2001 indicating that the north west sector will remain the most heavily populated.

South West Sector:

Population projections estimate a population of 313,000 in the south west sector by 2001, accounting for 18.5 percent of the metropolitan total. It is estimated that there will be 101,100 households by this time, an increase of 63,800 over 1971 figures. Early projections are based on the decline in growth in this sector in the period subsequent to 1971 but assume a gradual upsurge in growth subsequent to 1981.

DIAGRAM. 3.

HOUSEHOLD CHANGE BY RING SECTOR PERTH METROPOLITAN REGION 1961 - 1971



SOURCE : A.B.S.
U.S.C. 1974.

HOUSEHOLD TRENDS BY SECTOR
PERTH METROPOLITAN REGION
1961-1971

SECTOR	TOTAL HOUSEHOLDS			1961 Number	- 1966 Percent	AVERAGE ANNUAL 1966 Change Number	- 1971 Percent
	1961	1966	1971				
North West							
Perth	26,258	27,976	30,749	344	1.3%	554	2.0%
Wanneroo	431	642	2,345	42	9.8%	341	53.1%
Stirling	22,401	30,750	43,906	1,670	7.5%	2,631	8.6%
Subiaco	5,150	5,549	6,155	80	1.6%	121	2.2%
Nedlands	5,860	6,084	6,415	45	0.8%	66	1.1%
Claremont	2,322	2,517	2,813	39	1.7%	59	2.4%
Cottesloe	2,604	2,893	3,063	59	2.2%	34	1.2%
Peppermint Grove	448	457	433	2	4.0%	-4	-0.8%
Mosman Park	1,653	1,728	2,481	15	9.1%	151	8.7%
Total North West	67,127	78,596	98,365	2,294	3.4%	3,954	5.0%
South West							
East Fremantle	1,897	1,980	2,225	17	8.8%	49	2.5%
Fremantle	6,277	6,737	7,357	92	1.5%	124	1.8%
Melville	10,216	12,808	15,019	518	5.0%	422	3.5%
Cockburn	1,774	3,465	6,426	338	19.0%	592	17.0%
Kwinana	1,128	1,345	2,961	43	3.9%	323	24.0%
Rockingham	825	1,368	3,317	109	13.2%	390	28.5%
Total South West	22,117	27,703	37,305	1,117	5.0%	1,920	6.9%
North East							
Belmont	5,193	6,859	8,688	333	6.4%	366	5.3%
Bayswater	5,105	6,911	9,377	361	7.0%	493	7.1%
Bassendean	2,231	2,642	3,099	82	3.7%	91	3.5%
Swan	4,632	4,767	6,589	27	0.6%	364	7.6%
Mundaring	2,217	2,467	3,359	50	2.3%	178	7.2%
Kalamunda	2,025	2,583	4,840	112	5.5%	451	17.5%
Total North East	21,403	26,229	35,952	965	4.5%	1,946	7.4%
South East							
South Perth	8,314	9,798	10,497	297	3.6%	140	1.4%
Canning	4,497	5,995	9,271	300	6.7%	655	10.9%
Gosnells	2,607	3,044	5,986	87	3.4%	588	19.3%
Armadale-Kelmscott	1,761	2,094	4,169	67	3.9%	415	19.8%
Serpentine-Jarrahdale	475	428	474	-9	-2.0%	9	2.2%
Total South East	17,654	21,359	30,397	742	4.2%	1,807	8.5%
Grand Total	128,301	153,887	202,019	5,117	4.0%	9,626	6.3%
Source: ABS USC 1974							

TABLE 7

POPULATION PROJECTIONS BY SECTOR ¹⁾
 PERTH METROPOLITAN REGION
 1971-2001

SECTOR	TOTAL POPULATION							
	1971	1974	1976	1981	1986	1991	1996	2001
North West	326,988	348,800	369,000	424,100	487,000	559,400	644,800	747,800
South West	135,014	144,050	148,400	169,700	198,000	232,600	269,800	313,000
North East	134,311	144,050	152,400	179,900	207,800	238,900	276,900	321,300
South East	106,886	121,300	132,400	158,500	189,400	226,300	266,900	309,600
Total Perth Region	703,199	758,200	802,200	932,200	1,082,200	1,257,200	1,458,400	1,691,700

1) Assumes no constraints or encouragement to development in any sector

SECTOR	AVERAGE ANNUAL CHANGE											
	1971 - 1976		1976 - 1981		1981 - 1986		1986 - 1991		1991 - 1996		1996 - 2001	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
North West	8,402	2.6%	11,020	3.0%	12,580	3.0%	14,480	3.0%	17,100	3.1%	20,600	3.2%
South West	2,677	2.0%	4,260	2.9%	5,660	3.3%	6,920	3.5%	7,440	3.2%	8,640	3.2%
North East	3,618	2.7%	5,500	3.6%	5,580	3.1%	6,220	3.0%	7,580	3.2%	8,880	3.2%
South East	5,103	4.8%	5,220	3.9%	6,180	3.9%	7,380	3.9%	8,120	3.6%	8,540	3.2%
Total Perth Region	19,800	2.8%	26,000	3.2%	30,000	3.2%	35,000	3.2%	40,240	3.2%	46,660	3.2%

Source: USC 1974

TABLE 8

HOUSEHOLD PROJECTIONS BY SECTOR
 PERTH METROPOLITAN REGION
 1971-2001

SECTOR	TOTAL HOUSEHOLDS							
	1971	1974	1976	1981	1986	1991	1996	2001
North West	98,365	106,700	114,600	134,600	157,000	183,400	212,500	246,400
South West	37,305	40,300	42,100	49,900	60,000	72,700	86,350	101,100
North East	35,952	39,000	41,900	51,400	61,100	72,400	86,100	101,200
South East	30,397	34,800	38,300	46,600	57,400	70,700	85,100	100,000
Total Perth Region	202,019	220,800	236,900	282,500	335,500	399,200	470,050	548,700

SECTOR	AVERAGE ANNUAL HOUSEHOLD CHANGE											
	1971-1976		1976-1981		1981-1986		1986-1991		1991-1996		1996-2001	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
North West	3,250	3.3%	4,000	3.5%	4,480	3.3%	5,280	3.4%	5,820	3.2%	6,780	3.2%
South West	960	2.6%	1,560	3.7%	2,020	4.1%	2,540	4.2%	2,730	3.8%	2,950	3.4%
North East	1,190	3.3%	1,900	4.5%	1,940	3.8%	2,260	3.7%	2,740	3.8%	3,020	3.5%
South East	1,580	5.2%	1,660	4.3%	2,160	4.6%	2,660	4.6%	2,880	4.1%	2,980	3.5%
Total Region Change	6,980	3.5%	9,120	3.9%	10,600	3.8%	12,740	3.8%	14,170	3.6%	15,730	3.4%

Source: USC 1974

North East Sector:

It is projected that this sector will contain 321,300 persons by 2001, 19.0 percent of the metropolitan total. It is estimated that there will be 101,200 households by 2001.

South East Sector:

It is estimated that the population of this sector will number 309,600 by 2001 giving this sector an 18.3 percent share of the Region total. Household projections indicate a total of 100,000 households by the year 2001.

It is evident that the north west sector has remained the most populous sector of the region and will continue to attract a high proportion of regional growth. In particular, the outer ring of this sector (equivalent to the Wanneroo Shire area) is likely to remain the fastest growth area in the entire region.

3.4 Population Characteristics in the North West Corridor

The City of Stirling and the Shire of Wanneroo comprise the second and third ring of the north west sector. They will be examined in detail and compared with the Perth Metropolitan Region as a whole, since the trends experienced in these areas will be most relevant to the future development of Mindarie.

i. Age Structure

Table 9 shows the age structure of the population in Stirling and Wanneroo at the time of the 1966 and 1971 censuses. For comparative purposes, a similar breakdown for the Perth Metropolitan Region is included.

For the City of Stirling, the percentage of the population in the different age groupings remained relatively constant between 1966-1971, except in the 20-44 age group which registered a 2.3 percent rise.

In Wanneroo the percentage in the 0-4 age group rose significantly from 11.9 percent in 1966 to 15.3 percent in 1971. There was also a significant increase in the 20-44 age group and a decline in the 45-64 and the 65 and over brackets. Clearly, the number of families with young children entering the area has increased. It is anticipated that this trend will continue and that the Shire of Wanneroo will have a relatively young population profile for at least the next decade. The pattern of population aged 20-44 for the Shire of Wanneroo confirms this; in June 1971, there were 1905 persons in the 20-29 age bracket with a further 779 in the 30-34 group.

TABLE 9

AGE DISTRIBUTION

PERTH METROPOLITAN REGION, STIRLING & WANNEROO

1966-1971

AGE	PERTH METROPOLITAN REGION			
	1966		1971	
	No.	%	No.	%
0- 4	52,712	9.4%	67,036	9.5%
5-14	114,268	20.5%	139,035	19.7%
15-19	55,707	9.9%	67,868	9.6%
20-44	175,276	31.2%	241,851	34.4%
45-64	112,526	20.1%	130,835	18.6%
65 over	48,332	8.7%	56,574	8.0%
Total	558,824	100.0%	703,199	100.0%

AGE	STIRLING			
	1966		1971	
	No.	%	No.	%
0- 4	13,404	11.7%	16,435	10.6%
5-14	25,678	22.4%	32,896	21.2%
15-19	10,186	8.9%	14,412	9.3%
20-44	38,717	33.8%	55,843	36.1%
45-64	18,935	16.6%	25,335	16.4%
65 over	7,490	6.6%	9,961	6.4%
Total	114,410	100.0%	154,882	100.0%

AGE	WANNEROO			
	1966		1971	
	No.	%	No.	%
0- 4	291	11.9%	1,319	15.3%
5-14	555	22.8%	1,859	21.6%
15-19	218	9.0%	577	6.7%
20-44	815	33.4%	3,700	42.9%
45-64	437	17.9%	935	10.8%
65 over	121	5.0%	230	2.7%
Total	2,437	100.0%	8,620	100.0%

Source: ABS USC 1974

Age distribution in the Perth Metropolitan Region compared with that of the City of Stirling shows a similar percentage in the 20-44 age group and a lower percentage of persons aged over forty five in the latter. Wanneroo, on the other hand, has a significantly higher percentage of persons aged under four and in the 20-44 age bracket and a much lower percentage over the age of forty five than applied in the Region as a whole.

ii. Ethnic Origin

To aid social and recreational planning for Mindarie an analysis of the resident population by ethnic origin was undertaken for the Shire of Wanneroo, the City of Stirling and for the Perth Metropolitan Region.

TABLE 10

ORIGIN OF POPULATION BY BIRTHPLACE JUNE 1971

	WANNEROO		STIRLING		METROPOLITAN REGION	
	NO.	%	NO.	%	NO.	%
Australia & N.Z.	5,459	63.33%	112,936	72.92%	484,896	68.96%
UK & Ireland	2,188	25.38%	22,814	14.73%	125,281	17.82%
Other Europe ^{a)}	703	8.16%	13,346	8.62%	64,304	9.14%
Other ^{b)}	270	3.13%	5,786	3.74%	28,718	4.08%
TOTAL	8,620	100.0%	154,882	100.0%	703,199	100.0%

Source: ABS, USC 1974

- a) Includes Austria, Czechoslovakia, Germany, Greece, Hungary, Italy, Malta, Netherlands, Poland, USSR, Yugoslavia, other European.
- b) Includes Asia, Africa, America, Canada, all other areas.

Table 10 indicates that approximately 25 percent of persons living in the Wanneroo Shire were born in the UK or Ireland*. This compares with 14.7 percent in the City of Stirling and 17.8 percent for the Perth Region as a whole. Similarly

* Of the outer area Shires, only Armadale-Kelmscott and Rockingham with 30.4 percent and 40.1 percent respectively, have higher percentages of residents born in the UK or Ireland.

the percentage of persons born in Australia or New Zealand is lower in Wanneroo than in Stirling or the Perth Region. The percentage of persons born in Europe and all other areas is relatively evenly distributed in the three areas examined. Since the population of the Wanneroo Shire at the 1971 census was only 8,620 persons, it is difficult to predict whether these trends will continue as development proceeds.

iii. Income Levels

The census does not contain information on individual personal income and for the purposes of this study a statistical technique was employed to estimate average household income for the Shire of Wanneroo, the City of Stirling and the Perth Metropolitan Region. The method used and the detailed calculations are shown in Appendix 1.

The main features can be summarised as follows: For the Shire of Wanneroo the average wage estimate was \$6,341 per annum, while the average household income (taking into account the female workforce) was \$8,554 per annum. This compares with an estimated annual average wage of \$6,383 and an average household income of \$8,703 in the City of Stirling. For the Perth Region as a whole the average wage was calculated to be \$6,247 per annum while the average household income was estimated at \$8,390. The average household incomes are marginally higher in the Wanneroo Shire and the City of Stirling than in the Perth Region as a whole. Because the population base of the Wanneroo Shire is relatively small, it is difficult to predict whether this trend will be maintained as development continues.

3.5 Implications for Mindarie

i. Population Projections

Table 11 projects population growth for Mindarie in the period to 2001 when development will be reaching completion. The projections are based on projected growth rates in the north west sector and the Shire of Wanneroo. The projections were calculated from recent trends but because of the small base population, they will need to be periodically reassessed as more data becomes available.

On the basis of likely future developments within the Shire, it is assumed that Wanneroo will continue to attract an increasing percentage of regional growth, rising from 22 percent in the period 1974-1976 to 35 percent between 1996-2001. Table 12 sets out the projected population capture rates for Wanneroo Shire and for Mindarie in the period to 2001*.

In the early phases of development, it is expected that Mindarie's capture of total growth in the Wanneroo Shire will be low, amounting to only 5,000 persons by 1981 (or 15 percent of growth within the Shire). It is anticipated that development at Mindarie will gradually gain momentum and will reach a peak between 1991 and 1996 when some 20,000 people will settle there (30 percent of total population growth in Shire) bringing the population of Mindarie to 52,000 by the latter date. Between 1996 and 2001 it is expected that the population will reach 72,500 persons and that development will be nearing completion.

ii. Planning Implications

The dramatic rise in population in the Shire of Wanneroo during a period when population growth in the Region was severely curtailed is significant for the future development of Mindarie. There is an obvious demand for residential growth in the coastal areas north of Perth, which would be accelerated further by:

- industrial development on a large scale to the north of Mindarie
- the development of a regional centre at Lake Joondalup
- the establishment of Western Australia's third university at Joondalup
- the development of a vast recreational area surrounding Lakes Joondalup and Goolelal.

The analysis of population characteristics and growth in the Wanneroo Shire indicate that:

- it is experiencing the fastest rate of population growth in the Perth Region
- it is likely to continue to attract new households and housing units
- Mindarie will be able to attract a substantial proportion of the growth in the Shire after 1981

* The figures for Mindarie were established after an examination of capture rates (based on building permits issued) in Marmion, Duncraig, Whitford, Mullaloo and will be verified by market studies in Stage III.

TABLE 11

PROJECTED POPULATION
MINDARIE ENVIRONMENTAL CITY
1974-2001

TOTAL POPULATION	1974	1976	1981	1986	1991	1996	2001
Perth Metropolitan Region	758,200	802,200	932,200	1,082,200	1,257,200	1,458,400	1,691,700
North West Sector	348,800	369,000	424,100	487,000	559,400	644,800	747,800
Shire of Wanneroo	27,500	36,300	68,800	109,300	161,800	228,300	309,800
Mindarie	-	-	5,000	13,500	32,000	52,000	72,500

Source: USC 1974

TABLE 12

PROJECTED POPULATION CAPTURE RATES
MINDARIE ENVIRONMENTAL CITY
1974-2001

	AVERAGE ANNUAL POPULATION GROWTH CAPTURE					
	1974-1976	1976-1981	1981-1986	1986-1991	1991-1996	1996-2001
Percentage of Perth Regional Growth in Wanneroo Shire	22.0%	25.0%	27.0%	30.0%	33.0%	35.0%
Percentage of North West Growth in Wanneroo Shire	52.0%	59.0%	64.0%	72.0%	78.0%	79.0%
Percentage of Wanneroo Shire Growth in Mindarie Environmental City	-	15.0%	20.0%	25.0%	30.0%	25.0%

Source: USC 1974

- the initial phases of development at Mindarie are likely to attract young families
- higher income groups could be attracted by the nature of the development proposed at Mindarie

4 Employment

4. EMPLOYMENT

4.1 Employment in the Perth Metropolitan Region

Trends

In the past two decades there has been a substantial increase in all forms of employment in the Perth region. Fluctuations have occurred with changing economic conditions, but the period has basically been one of growth and diversification. Industrial development has been increasing and the growth of employment in service industries such as finance, communications, transport and storage, community services, public administration and entertainment has been significant. This is in keeping with world wide trends. The building and construction industry remains a substantial employer of labour despite its sensitivity to economic conditions.

In order to simplify the process of identifying the major trends in employment, four basic categories will be used:

- primary production - includes fishing, forestry, agriculture, mining and quarrying
- manufacturing-includes both heavy and light industrial activity
- building and construction
- service industries:
 - *wholesale and retail trade
 - *electricity, water, sewerage
 - *transport and storage, communication,
 - *finance etc.
 - *public administration and defence
 - *community services, entertainment etc.
- *other industries - includes law, order and public safety; religion and social welfare; other community and business services; amusement, sport and recreation; hotels, boarding houses and other accommodation, restaurants; other personal services

ii. Service Industries

It is estimated that approximately 60 percent of the workforce living at Mindarie will be engaged in service employment. Using current labour participation rates for the Wanneroo Shire it is estimated that there will be more than 18,000 service workers living at Mindarie when the development is complete. Many of these workers will continue to be employed in the Central Business District but a proportion will prefer to be locally employed.

Retail Trade:

Mindarie will have a major retail and commercial centre when fully developed as well as several neighbourhood centres which will be centrally located within the residential precincts. It is anticipated that these will be a major source of local employment, particularly of female labour.

Community Services:

These will be developed in conjunction with residential areas. It is difficult to predict the extent of local employment in these services. Much will depend on the extent of their development. For example, a regional hospital would provide substantial local employment as will the third university, projected for the north-west corridor.

Table 17 projects the number of community and retail jobs likely to be created at Mindarie on the basis of projected residential development. It is estimated that 5,800 community jobs and 2,100 retail jobs could be available at Mindarie by 2001.

Finance and Property, Administration Etc:

It is unlikely that there will be any significant employment in these areas during the early phases of development. These services tend to be strongly attracted to the Central Business District and substantial incentive would be required to attract them to a regional centre. Some employment would be provided in branch offices of building societies, banks, post offices etc. The possibility exists of attracting commercial employment to Mindarie if large employers such as government departments and insurance offices can be convinced of the benefits of regional decentralisation.

It is anticipated that Mindarie will develop the status of a regional centre when it approaches full development so that new industries and services will locate within its boundaries to serve Mindarie and the surrounding developments.

Table 13 demonstrates the main trends in employment in the Perth Region between 1954 and 1971. Service industries as a whole have been growing faster than any of the other categories. Within this group the fastest growing industries are finance, public administration and wholesale and retail trade.

Diagram 4 shows the change in the distribution of employment between 1961 and 1971. The dominant role of service employment is clearly shown as is the relative decline of manufacturing and primary industry.

Range of Employment

i. Manufacturing

The major concentration of manufacturing establishments is found within the Perth Metropolitan Region. Fig. 2 shows the main industrial zones.

Heavy Industry:

Kwinana, in the south west corridor was established in the 1950's and remains the major area for heavy industry in the Region. It comprises some 2,900 hectares with an oil refinery, steel rolling mill, fertiliser plants, bulk handling facilities, alumina, nickel, cement and polyurethane works together with several smaller industries. Although land is still available at Kwinana, the area is reaching saturation and sites suitable for major industries are in short supply. Further growth of heavy industry in the Perth Region will require an alternative site to be set aside for eventual development.

Light Industry:

The major complexes are found at Welshpool, Kewdale, Cannington, Fremantle and Spearwood, while smaller areas have developed at Balcatta, Beechboro, Midland, Osborne Park, Bayswater, O'Connor and Jandakot. Small pockets of industry continue to exist in inner city areas such as East Perth, West Perth, Subiaco, Belmont and Melville. Approximately one third of the factories are engaged in the production of metal and metal products and related repairs. Other light industries include food and beverages, clothing and footwear, wood and furniture, paper products and miscellaneous products, including leather goods, jewellery and plastics. While many of these concerns will continue to prefer a central location, others will be attracted to outer areas by cheaper land and new concentrations of population.

TABLE 13

EMPLOYMENT TRENDS
PERTH METROPOLITAN REGION
1954-1971

INDUSTRY	1954	TOTAL EMPLOYED		1971	AVERAGE ANNUAL CHANGE		
		1961	1966		1954- 1961	1961- 1966	1966- 1971
Primary Production	7,091	7,139	7,170	8,541	0.09%	0.08%	3.9%
Manufacturing	39,272	41,513	50,887	53,933	0.8 %	4.5 %	1.2%
Building and Construction	19,470	15,232	20,878	27,363	-3.1 %	7.4 %	6.2%
<u>SERVICE INDUSTRIES</u>							
Wholesale & Retail Trade	32,301	37,997	46,480	64,944	2.5 %	4.5 %	7.9%
Electricity, Water Supplies & Sewerage	3,045	3,420	3,940	3,459	1.8 %	3.0 %	-2.4%
Transport, Storage & Communication	15,531	17,018	20,022	23,592	1.56%	3.5 %	3.5%
Finance Etc.	5,234	7,088	9,903	24,149	5.1 %	7.9 %	28.8%
Public Administration & Defence		9,520	11,707	17,097		4.6 %	9.2%
Community Services	24,554*	34,914	46,917	52,856	6.8 %	6.8 %	2.5%
Entertainment Etc.	10,647						
Other Industries Not Stated	1,196	2,873	3,631	10,541	20.0 %	5.3 %	38.1%
Total Service Industries	92,508	112,830	142,600	196,638	3.13%	5.2 %	7.6%
Total Employed	158,341	176,714	221,535	286,475	1.7 %	5.1 %	5.9%

* In 1954 census, Public Administration & Defence and Community Services were combined

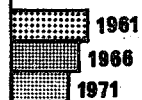
Source: ABS

DIAGRAM 4.

EMPLOYMENT DISTRIBUTION BY INDUSTRY
PERTH METROPOLITAN REGION
1961 - 1971

INDUSTRY

PRIMARY
PRODUCTION



MANUFACTURING



BUILDING AND
CONSTRUCTION



SERVICE INDUSTRY



SOURCE : A.B.S.
U.S.C. 1974.

ii. Service Employment

This category of employment includes retail, wholesale, finance, property, administration, defense and entertainment. In 1971, these industries employed 68 per cent of the regional workforce with a high proportion working in the Central Business District and surrounding areas. It is expected that this category of employment will continue to expand.

While it is anticipated that the Central Business District will retain the major concentration of service jobs, it is likely that recent trends towards a proportional increase of service employment (particularly retail jobs) outside the Central Business District in suburban centres such as Booragoon, Carousel and Karrinyup, will continue. Wholesale industries, particularly large warehouse establishments, may tend to locate close to the new industrial zones such as Kewdale. Office employment is likely to remain concentrated in the Central Area and inner suburbs although it is possible that some decentralisation will occur as a result of government policies to foster commercial growth in out-of-town centres.

4.2 Projected Employment in the Perth Region

Employment projections for the Perth Metropolitan Region (shown in Table 14) indicate that substantial growth in employment can be expected in the period to 2001 and that service industries will continue to attract an increasing percentage of the workforce. Diagram 5 demonstrates the likely distribution of employment between 1971 and 2001.

It is anticipated that the labour participation rate will continue to rise and that it could be as high as 45 per cent of the population by 2001. Most of this increase would be due to increasing female participation rates. The main areas of growth can be expected to fall within the following categories.*

* All figures are based on current trends and take no account of possible government action to promote or discourage particular industries or occupations in the Region.

EMPLOYMENT PROJECTIONS
PERTH METROPOLITAN REGION
1971-2001

INDUSTRY	TOTAL RESIDENT EMPLOYMENT							
	1971 No.	1974 No.	1976 No.	1981 No.	1986 No.	1991 No.	1996 No.	2001 No.
Primary Production	8,541	9,450	10,050	11,550	13,550	15,800	18,050	20,300
Manufacturing	53,933	55,700	57,300	63,300	72,300	84,800	97,300	112,300
Construction	27,363	30,050	31,650	37,650	43,650	51,150	58,650	67,650
<u>SERVICE INDUSTRIES</u>								
Wholesale and Retail Trade	64,944	70,950	74,950	89,950	104,950	124,950	144,950	169,950
Electricity, Water Supplies and Sewerage	3,459	3,150	3,150	3,650	4,400	5,400	6,400	7,400
Transport, Storage and Communication	23,592	25,800	27,500	34,500	38,500	46,250	54,000	64,000
Finance	24,149	30,150	34,550	47,050	59,550	74,550	89,550	106,050
Public Administration and Defence	17,097	20,100	22,100	28,100	34,100	41,100	48,100	56,100
Community Services	36,902	39,300	41,300	48,800	57,800	67,800	77,800	88,800
Entertainment	15,954	16,850	17,450	19,200	21,200	23,450	25,700	28,200
Other and Not Stated	10,541	13,550	15,550	20,550	25,550	30,550	35,500	40,550
Total Service Industries	196,638	219,850	236,550	291,800	346,050	414,050	482,050	561,050
Total Employment	286,475	315,050	35,550	402,300	475,550	565,800	656,050	761,300

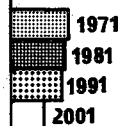
INDUSTRY	AVERAGE ANNUAL EMPLOYMENT CHANGE						
	1971-74 No.	1974-76 No.	1976-81 No.	1981-86 No.	1986-91 No.	1991-96 No.	1996-2001 No.
Primary Production	300	300	300	400	450	450	450
Manufacturing	600	800	1,200	1,800	2,500	2,500	3,000
Construction	1,000	800	1,200	1,500	1,500	1,500	1,800
<u>SERVICE INDUSTRIES</u>							
Wholesale and Retail Trade	2,000	2,000	3,000	3,000	4,000	4,000	5,000
Electricity, Water Supplies and Sewerage	-100	-	100	150	200	200	200
Transport, Storage and Communication	750	850	1,000	1,200	1,550	1,550	2,000
Finance	2,000	2,200	2,500	2,500	3,000	3,000	3,300
Public Administration and Defence	1,000	1,000	1,200	1,200	1,400	1,400	1,600
Community Services	800	1,000	1,500	1,800	2,000	2,000	2,200
Entertainment	300	300	350	400	450	450	500
Other and Not Stated	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Service Industries	7,100	8,350	10,650	11,250	13,600	13,600	15,800
Total Employment	9,650	10,250	13,650	14,650	18,050	18,050	21,050

DIAGRAM 5.

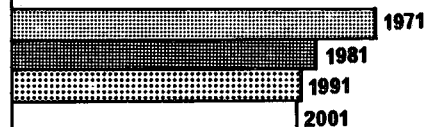
PROJECTED EMPLOYMENT DISTRIBUTION BY INDUSTRY
PERTH METROPOLITAN REGION
1971 - 2001

INDUSTRY

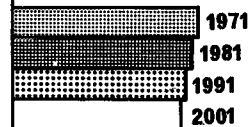
PRIMARY
PRODUCTION



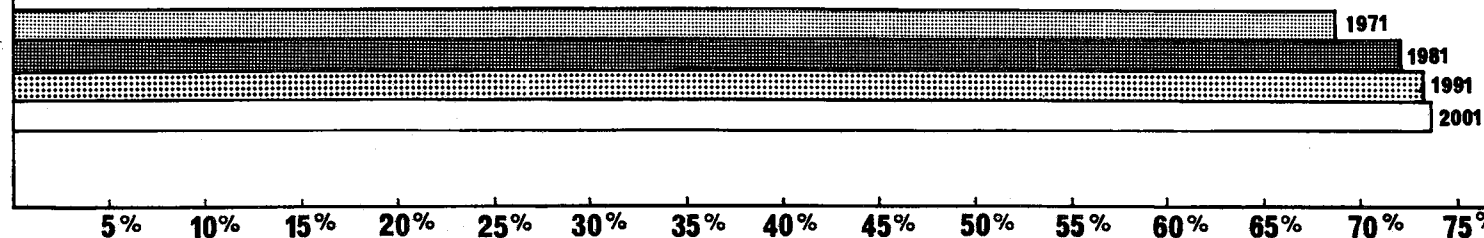
MANUFACTURING



BUILDING AND
CONSTRUCTION



SERVICE INDUSTRY



SOURCE : A.B.S.
U.S.C. 1974.

Manufacturing:

If current trends continue, it is estimated that between 1971 and 2001 the number of people employed in manufacturing industries will rise from 53,930 to more than 112,000 and that the manufacturing workforce will comprise 14.8 per cent of the total by 2001. If major new industries can be attracted to the Region, the growth rate of this sector will be faster than anticipated. However, this may require special incentives which are established by political decision and cannot be projected.

Construction:

Between 1971 and 2001, the number of people employed in the construction industry is expected to increase from 27,360 to 67,650, while its share of total employment will be about 9 percent.

Wholesale and Retail Trade:

The number of persons employed in this category is expected to rise from 64,950 in 1971 to 170,000 in 2001. The percentage of total jobs is expected to remain relatively constant at around 22 percent of the total, thus making this group the largest employer of labour in the Region.

Finance and Property:

This has been a major growth sector since 1966 reflecting the expansion and diversification in the economy. It is expected that this trend will continue and that employment in this sub-group will rise from 24,150 persons in 1971 to 106,000 persons in 2001 and that its percentage share of total employment will increase from 8.4 percent in 1971 to 14.0 percent in 2001.

Public Administration and Defence:

With present trends, it is projected that the public service workforce will continue to increase as government services grow in range and complexity. Employment in this category is expected to rise from 17,100 persons in 1971 to 56,000 in 2001.

Community Services:

Employment tended to lag between 1966 and 1971 when the growth industries were absorbing the available labour force. It is anticipated that community pressures for improved services will result in more jobs being created in this category in the period to 2001. Projections

indicate that employment will rise from 36,900 persons in 1971 to 88,800 persons in 2001, representing 11.6 percent of total employment in the Region.

Growth in employment on the scale envisaged indicates that additional commercial and industrial areas will be needed in the Perth Region in the period to 2001. It is desirable for these to be located in areas of growth, accessible to new residential developments.

4.3 Employment Trends by Sector

The distribution of employment by sector in the Perth Region is shown on Diagram 6.

North West Sector:

Almost 60 percent of all jobs are located in this sector. Eighty percent of the jobs in finance, communications and public administration are located in the north west with heaviest concentration in the Central Business District. Thirty eight percent of all basic jobs (manufacturing and mining) and 66 percent of all service jobs* are located in this sector. Major industrial areas are mapped in Fig. 2.

South West Sector:

Seventeen and a half percent of all metropolitan jobs are located in this sector and, of these, 37 percent are in manufacturing reflecting the impact of the Kwinana industrial area. Twenty-six percent of all basic employment and fifteen percent of service employment are located in this sector.

North East Sector:

This sector accounts for fourteen percent of the total jobs in the region. Manufacturing is the dominant employment category, accounting for thirty six percent of all sector jobs. Twenty one percent of all basic jobs and twelve percent of total service employment in the region are located in this sector.

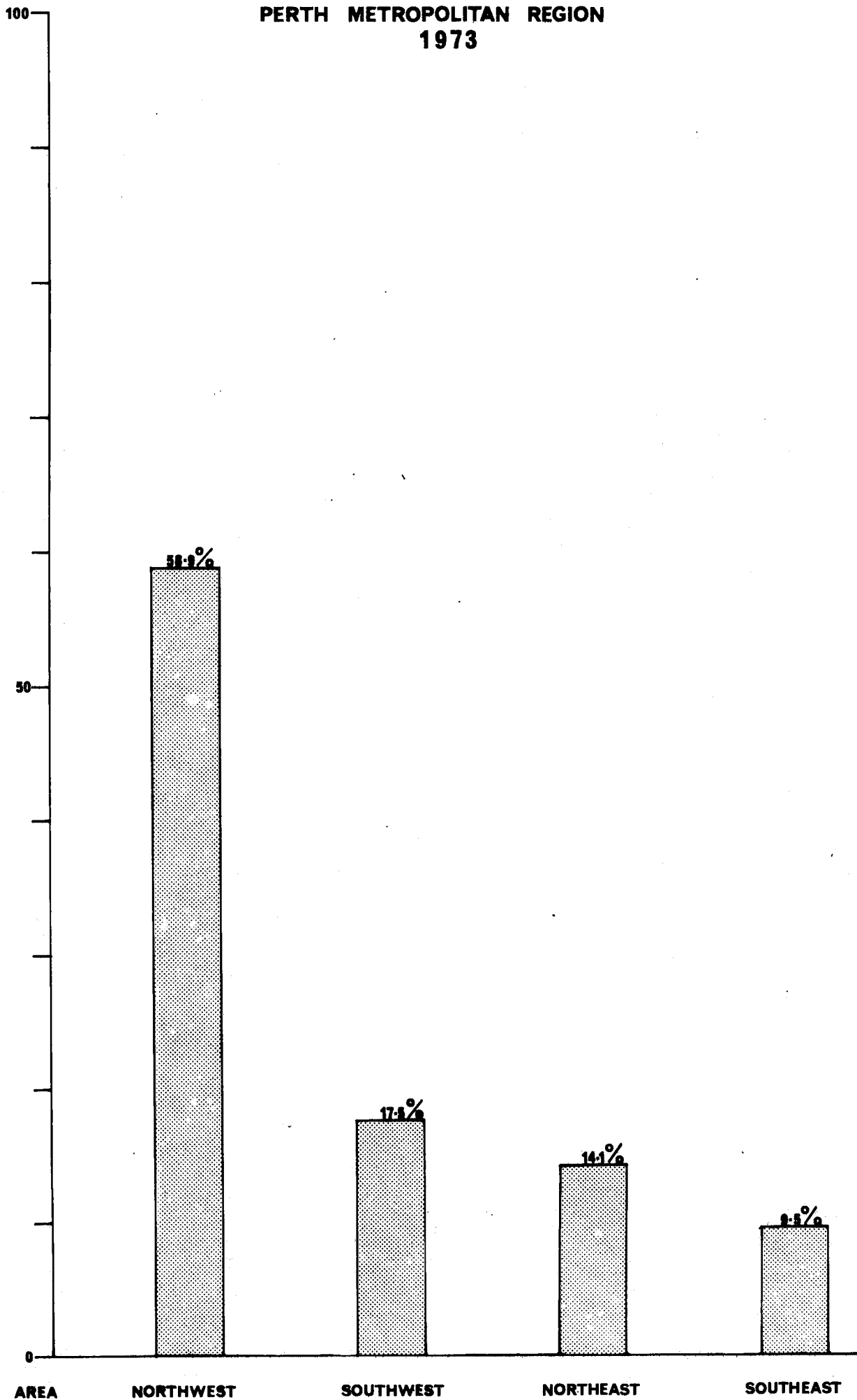
South East Sector:

This sector contains the lowest percentage of jobs in the region - 9.5 percent of the total. Fifteen percent of basic employment and 7.6 percent of service employment are located in this sector. Manufacturing and retail trade account for a high proportion of total jobs in this sector. Diagram 7 illustrates the distribution of basic and service employment in the Perth Region in 1973.

* Includes construction employment.

DIAGRAM. 6.

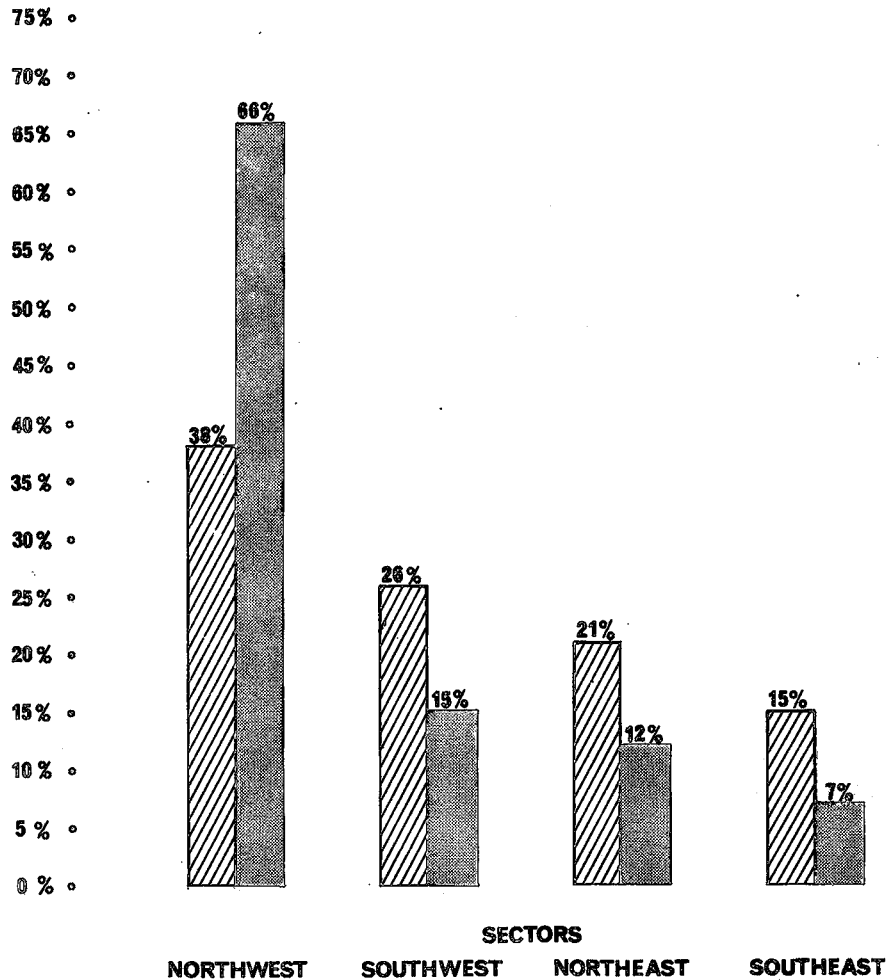
DISTRIBUTION OF EMPLOYMENT BY SECTOR
PERTH METROPOLITAN REGION
1973



SOURCE : A.B.S.
U.S.C. 1974.

DIAGRAM. 7.
BASIC AND SERVICE EMPLOYMENT BY SECTOR
PERTH METROPOLITAN REGION
1973

PERCENT OF
METROPOLITAN
TOTAL



KEY :



BASE.
EMPLOYMENT



SERVICE
EMPLOYMENT

NOTE :

BASE - MINING AND MANUFACTURING

SERVICE - ELECTRICITY AND GAS, WHOLESALE AND RETAIL TRADE,
 TRANSPORT AND STORAGE, COMMUNICATIONS, FINANCE,
 INSURANCE AND REAL ESTATE, PUBLIC ADMINISTRATION,
 COMMUNITY SERVICES, CONSTRUCTION

SOURCE :

A.B.S.
U.S.C. 1974

The north west sector contains the highest number and percentage of white collar workers (professional, administrative, clerical, sales and service workers) and the lowest percentage of blue collar workers (craftsmen), while the south west and north east sectors have high percentages of blue collar and lower percentages of white collar workers living in them. Table 15 demonstrates the main trends between 1966 and 1971.

If these trends continue it is likely that greater numbers of white collar workers will be attracted to the north west sector as a place to live and that many of them will work in the Central Business District. However, if in the future heavy industry is developed in this corridor it is likely that a demand for low cost accommodation will arise. Provision needs to be made for this possibility in planning the development of new residential areas in the north west sector.

4.4 Employment Potentials in the North West Sector

The north west sector, particularly the area within the Shire of Wanneroo, has experienced rapid population growth since 1971. It is estimated that its population in June 1974, approximated 27,000 people*. With an average labour participation rate of 38 percent, there are already approximately 10,450 working persons living in the Shire of Wanneroo. However, job opportunities in the area are negligible.

As development in the north west corridor moves further from the central core, the problems of access to jobs in the Central Business District or inner city workplaces are likely to create a demand for employment areas which are accessible from new residential areas. The types of industries to be attracted to Mindarie and their likely distribution will be the subject of more detailed study. However, the following categories of employment are among those likely to locate in the north west sector as the population of the outer area grows.

Service Employment:

This will be generated naturally in areas where population is concentrated. Some of this employment will be located in smaller suburban centres but most of the available service jobs will be concentrated in the regional centre, at Lake Joondalup or Mindarie. Shopping and commercial facilities, schools, health services and hospitals, professional services, libraries etc, will account for most of the service employment in the north west and

* These figures are based on estimates by the Australian Bureau of Statistics and are considerably lower than Shire estimates.

TABLE 15

OCCUPATION TRENDS BY SECTOR
 PERTH METROPOLITAN REGION
 1966-1971

OCCUPATION CLASS	TOTAL EMPLOYED			
	1966		1971	
	No.	% Distri- bution	No.	% Distri- bution
<u>NORTH WEST SECTOR</u>				
White Collar Workers	66,071	58.8%	83,192	61.2%
Blue Collar Workers	34,558	30.8%	37,068	27.2%
Other*	11,683	10.4%	16,673	11.6%
Total North West	112,312	100.0%	136,933	100.0%
<u>SOUTH WEST SECTOR</u>				
White Collar Workers	19,039	47.1%	26,255	49.2%
Blue Collar Workers	16,186	40.0%	19,835	37.1%
Other	5,231	12.9%	7,349	13.7%
Total South West	40,456	100.0%	53,439	100.0%
<u>NORTH EAST SECTOR</u>				
White Collar Workers	16,559	42.9%	25,697	47.4%
Blue Collar Workers	16,013	41.6%	19,284	36.3%
Other	5,954	15.5%	8,701	16.3%
Total North East	38,526	100.0%	53,082	100.0%
<u>SOUTH EAST SECTOR</u>				
White Collar Workers	16,260	53.7%	24,004	55.7%
Blue Collar Workers	9,855	32.6%	12,892	29.9%
Other	4,126	13.7%	6,125	14.4%
Total South East	30,241	100.0%	43,021	100.0%

* The category "other" includes farmers, miners, transport workers, armed service workers and inadequately described occupations.

Source: USC 1974

will provide jobs for the local population, particularly for female workers. Unless the provision of services is planned in conjunction with development there is likely to be a lag between population growth and the availability of local service employment. Table 16 estimates the number of community jobs which are likely to be created by residential development in the Shire of Wanneroo until the year 2001. In the early years the number of available jobs is small but by 2001 it is likely that over 33,000 jobs will have been created in direct response to the requirements of the expanding population.

Manufacturing Employment:

This may be generated by deliberate government or privately sponsored policies for attracting industry to the area. Examples of policies used by various governments, both overseas and in Australia, include tax concessions, subsidised land prices and/or buildings, the provision of fully serviced land, transport subsidies etc. Alternatively there may be a natural progression of industry into areas of substantial population growth. In most cases, the successful development of industrial areas will be a combination of both factors. In the outer areas of the north west corridor it is probable that a definite policy aimed at attracting manufacturing industry will be needed if substantial employment is to be generated. This is largely because the attraction of already established industrial areas in terms of the availability of serviced land, proximity to the Perth Central Business District, major transport links and established markets outweigh the advantages of decentralised manufacturing employment at the present time.

Initial studies of the north-west corridor carried out on behalf of the Department of Urban and Regional Development in Canberra*investigated the potential for industrial development of approximately 6073 hectares of land located at the northern end of the corridor between Yanchep and Moore River. The complex was to include a port and heavy industries which could include a major steel mill, nickel processing, cryogenics, refractories, timber industries, ship building and the construction of offshore platforms for the gasfields of the north-west shelf. Abattoirs, a caustic soda plant, an oil refinery and a hot strip mill were also mentioned as possible industries which could locate in this area**.

Development on the scale envisaged would have a tremendous impact on the northwest corridor. A large construction workforce would be required and permanent employment would be provided for a substantial manufacturing workforce leading to strong demands for housing within easy access

* Maunsell & Partners Pty Ltd
"Perth North West Corridor Development Study" March 1973

** Ibid pages 70-77

TABLE 16

COMMUNITY JOBS CREATED BY RESIDENTIAL DEVELOPMENT

SHIRE OF WANNEROO

1974-2001

	1974	1976	1981	1986	1991	1996	2001
Population	27,500	36,300	68,800	109,300	161,800	228,300	309,800
Community Job Multiplier	0.05	0.05	0.07	0.08	0.08	0.08	0.08
Community Jobs Created	1,400	1,800	4,800	8,750	12,950	18,300	24,800
Retail Floor Space (sf)	131,000	180,000	389,000	688,000	1,093,000	1,645,000	2,486,000
Retail Employment Ratio (square feet/employee)	300	300	300	300	300	300	300
Retail Jobs Created	440	600	1,300	2,300	3,600	5,500	8,300
Total Jobs Created	1,840	2,400	6,100	11,050	16,550	23,800	33,100

TABLE 17

COMMUNITY JOBS CREATED BY RESIDENTIAL DEVELOPMENT

MINDARIE ENVIRONMENTAL CITY

1981-2001

	1981	1986	1991	1996	2001
Population	5,000	13,500	32,000	52,000	72,500
Community Job Multiplier	0.07	0.08	0.08	0.08	0.08
Community Jobs Created	350	1,000	2,600	4,200	5,800
Retail Floor Space	30,700	94,000	237,000	409,000	631,500
Retail Employment Ratio (square feet/employee)	300	300	300	300	300
	100	300	800	1,400	2,100
Total Jobs Created	450	1,300	3,400	5,600	7,900

Source: USC 1974

of the industrial estates.

Industrial development on this scale, while ensuring the successful growth of Mindarie, would dramatically alter the emerging profile and character of the north west corridor. Recent changes in government policy have thrown doubts on the early establishment of an industrial complex and port at Moore River, although the site is still being considered for a jumbo steel mill complex.

The possibility that the north west corridor is to contain a major industrial area will require the careful consideration of its natural resources such as the beaches, national parks and underground water supplies.

Construction Employment:

The projected population growth in the north west sector and the already evident expansion in the Shire of Wanneroo indicate that the construction industry could provide substantial employment for at least the next twenty years. The growth of associated products depots (for example concrete batching plant, hardware supplies, timber yards etc.) in locations close to major building activity would provide additional local employment.

4.5 The Prospects for Employment at Mindarie

Development on the scale envisaged at Mindarie will require that local employment opportunities be created. Because of the lack of certainty surrounding the development of a heavy industrial complex at Moore River, it has not been taken into account in the initial planning of Mindarie. Positive initiatives towards such a development would require a review of the Corridor itself and of the present Mindarie proposals. The categories of employment which are most likely to develop successfully at Mindarie include:

Manufacturing: - particularly light industry.

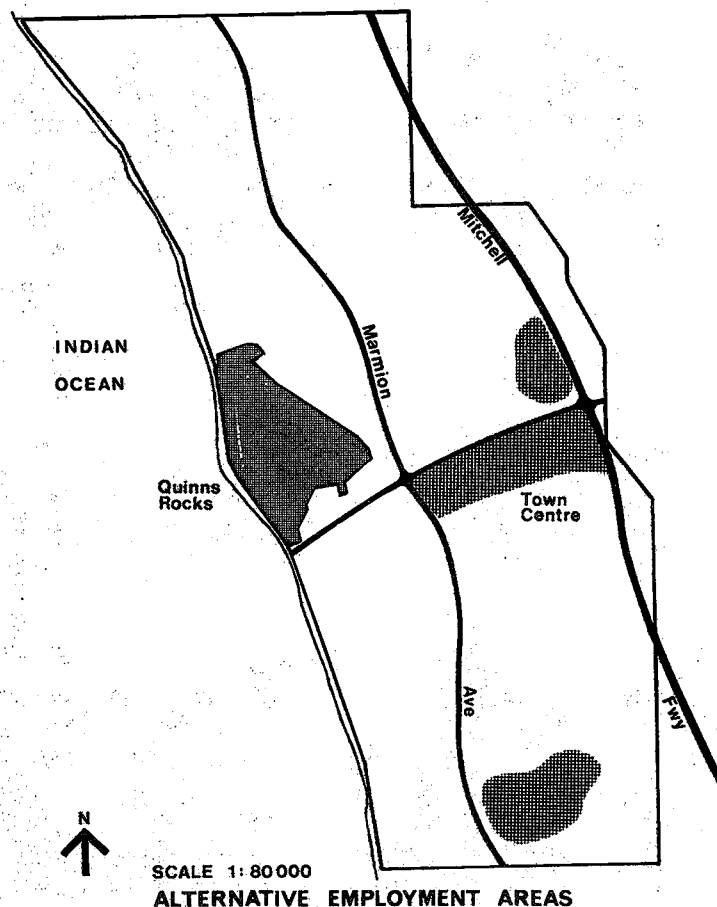
Construction: - the expected building programmes will provide employment and opportunities for establishing building warehouses and manufacturing outlets for building products.

Service Industries: - in the initial phases of development retail trade and community services will provide some local employment. As development proceeds employment opportunities will expand in other service fields such as finance and property, education, communications and administration.

The following sub-sections discuss the potentials for the development of manufacturing and service industries at Mindarie.

i. Manufacturing

It is recommended that the establishment of an Industrial Park of 80-120 hectares at Mindarie be investigated. Alternative sites in the north east and in the southern section of the development (shown on Fig. 4) have been examined. The northern location was tentatively chosen after reference to site characteristics and accessibility to the proposed freeway and Marmion Avenue and is shown on the Interim Development Plan. A single industrial area is recommended because it offers major economies of operation. A final selection will be made once the pattern and timing of the main access routes have been accurately determined. Smaller pockets of service industry, for example repair shops, service stations and warehouses, can be located in the vicinity of residential areas, on main roads and in association with local centres.



ALTERNATIVE EMPLOYMENT AREAS

Fig. 4

It is recommended that general and light industries be permitted to locate at Mindarie so that the environment and character of the proposed development can be maintained. Guidelines for pollution and noise control, building standards, traffic control and landscaping should be established as part of the Industrial Park concept when detailed feasibility and design work are undertaken. Fig. 5 illustrates one concept for an industrial park.

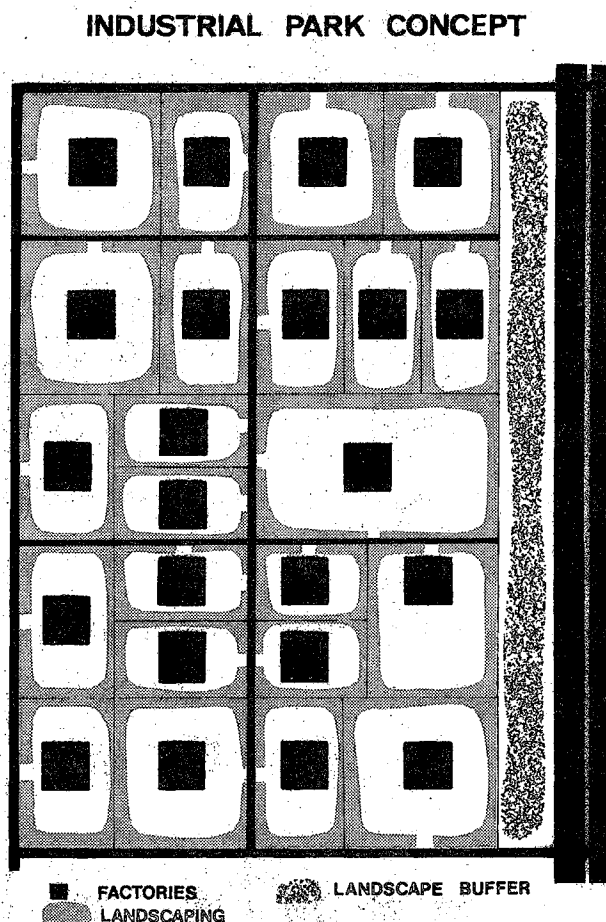


Fig. 5

Several factors are likely to influence the decision of manufacturing companies to establish at Mindarie. These include:

The availability of labour:

As the population of the north west corridor grows and the problems of access to the Central Business District and north-south movements across the Swan River increase the demand for local employment is likely to grow.

In 1971, there were 37,000 people in the category "craftsmen etc." living in the north west sector, representing 27 percent of the workforce. Assuming that Mindarie will attract a similar percentage of craftsmen, it is estimated that there will be a manufacturing labour force of some 8,000 persons living in the area when fully developed. It is likely that a substantial proportion of these workers would prefer to work locally if the opportunity were available.

Transport:

The transport links between Mindarie and Perth will need to be upgraded in order that industry can be attracted to the area. In the early phases of development, the upgrading of Wanneroo Road and the construction of Marmion Avenue will provide transport channels for industries based at Mindarie. However, as the population of Mindarie grows and the industrial estate generates more activity, a freeway link with Perth will become increasingly necessary.

Availability of serviced land:

As established industrial areas become crowded and the land becomes expensive, industry may be attracted to decentralised locations, especially if financial inducements (such as cheaper land, subsidised leases etc.) are provided and if adequate water supplies, power and waste disposal systems are made available.

Amenities:

Industry will often choose to locate in an area which is attractive to its potential labour force and managerial staff as a place to live. Mindarie fits into this category. It is close to the ocean, to Yanchep National Park, to the proposed Lake Joondalup centre and it will contain shopping, community and recreation facilities. A variety of housing will be provided and encouraged so as to attract a range of income groups.

On the basis of these criteria, Mindarie should be able to attract manufacturing industry once access is improved and its viability as a population centre demonstrated. It is recommended that the land be set aside prior to subdivision and that its development be undertaken after residential growth is underway.

It is not proposed to recommend specific industries which could be attracted to Mindarie without first undertaking a detailed market and industrial analysis. Broadly, food and drink, clothing and footwear industries, fabricated metal products and machinery and equipment have establishment potential at Mindarie especially when the population in the outer areas of the corridor grows. It is recommended that further research and analysis be undertaken prior to development.

5 Residential Development

5. RESIDENTIAL DEVELOPMENT

Residential development in the Perth Region has been characterised by the predominance of single family houses on relatively large individual lots. This has established the pattern of suburban growth evident throughout the region.

Current plans to confine future urban development into four corridors, extending from central Perth are unlikely to change preferences or the predominant form of housing and it is therefore anticipated that the single family house will remain the preferred mode in the foreseeable future.

However, the possibility does exist, particularly in new communities and especially where good planning can ensure adequate, convenient and imaginative open space and privacy, for higher density cluster or town house developments to capture a significant portion of the market. This could become particularly important as land prices rise and space develops a premium.

This chapter sets out the goals for residential development at Mindarie and the assumptions on which they are based.

5.1 Housing in the Perth Region

The construction of new housing units in the Region increased each year until 1970, which was the peak year for both house and flat development. This reflects the buoyant economic conditions of the period when the mining boom was at its height. Since 1970, flat development has declined significantly, while development of single houses expanded after 1971 and by 1973 had surpassed the peak of 1970. The continued growth in single housing in a period of moderate population growth, reflects a shortage and the backlog of demand which followed the population influx of the late 1960s.

Between June 1966 and December 1973, the number of private dwellings in the Perth Region increased from 163,196 to 240,494.

Table 18 shows total housing completions in the Perth Metropolitan Region from June 1963 to June 1973.

To give perspective to the new residential growth in the Perth Region annual population growth and annual housing completions have been correlated on Diagram 8. They clearly show a significant gap between housing completions and population growth in the period 1966-1971 as well as the subsequent growth in housing completions relative to population in 1972 and 1973.

DIAGRAM. 8.

ANNUAL POPULATION GROWTH AND HOUSING COMPLETIONS
PERTH METROPOLITAN REGION
1964 - 1973



SOURCE : ABS.
USC.1974

TABLE 18

TOTAL HOUSING COMPLETIONS
PERTH METROPOLITAN REGION
1963-1973

YEAR	HOUSES	FLATS	TOTAL
1963	4,997	611	5,608
1964	5,473	1,260	6,733
1965	5,473	1,765	7,238
1966	5,098	1,585	6,683
1967	5,330	1,634	6,964
1968	6,812	2,262	9,074
1969	9,246	3,172	12,418
1970	10,463	5,251	15,714
1971	7,805	4,748	12,553
1972	9,670	1,197	10,867
1973	11,453	770	12,223

Source: ABS

5.2 Residential Development Trends by Sector

Total housing completions by sector and the percentage capture of the regional market by each sector are shown on Diagrams 9 and 10.

North West Sector

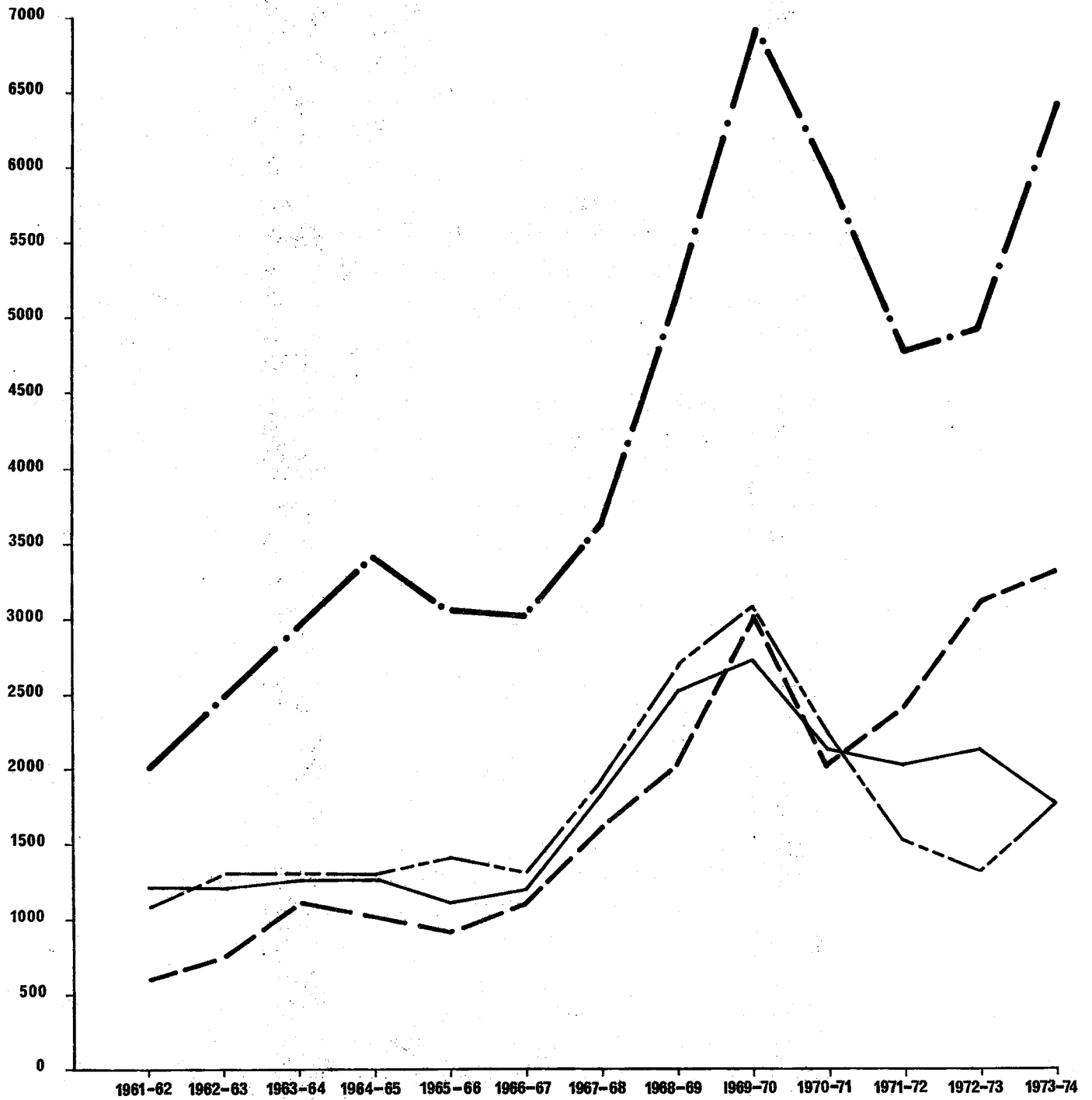
In 1971, this sector contained nearly half of the total metropolitan housing inventory. Of this, 73.3 percent were separate houses, 17.9 percent (the highest sector percentage) were self contained flats, while 8.8 percent came into the category of "other dwellings".

Between 1961 and 1973, the north west sector captured 44.6 percent of all new dwelling units while the Shire of Wanneroo experienced the highest average annual growth rate in housing completions in the Perth Region in the period 1966-1973.

South West Sector

In 1971, this sector contained 19 percent of the total metropolitan inventory of private dwelling units. Seventy nine percent were separate houses, 10 percent self contained flats and 11 percent other dwelling units. Between 1961 and 1968, the south west sector was capturing approximately 22 percent of all new dwelling units built in the Metropolitan region. Between 1969 and 1973, this capture rate dropped to only 15 percent, a decline of almost fifty percent in the sector's ability to attract residential growth.

DIAGRAM. 9.
TOTAL HOUSING COMPLETIONS BY SECTOR
 PERTH METROPOLITAN REGION
 1961 - 1974



SOURCE : A.B.S.
 U.S.C. 1974.

---•--- NORTHWEST
 - - - - - SOUTHWEST
 ———— NORTHEAST
 - - - - - SOUTHEAST

PERCENT
CAPTURE

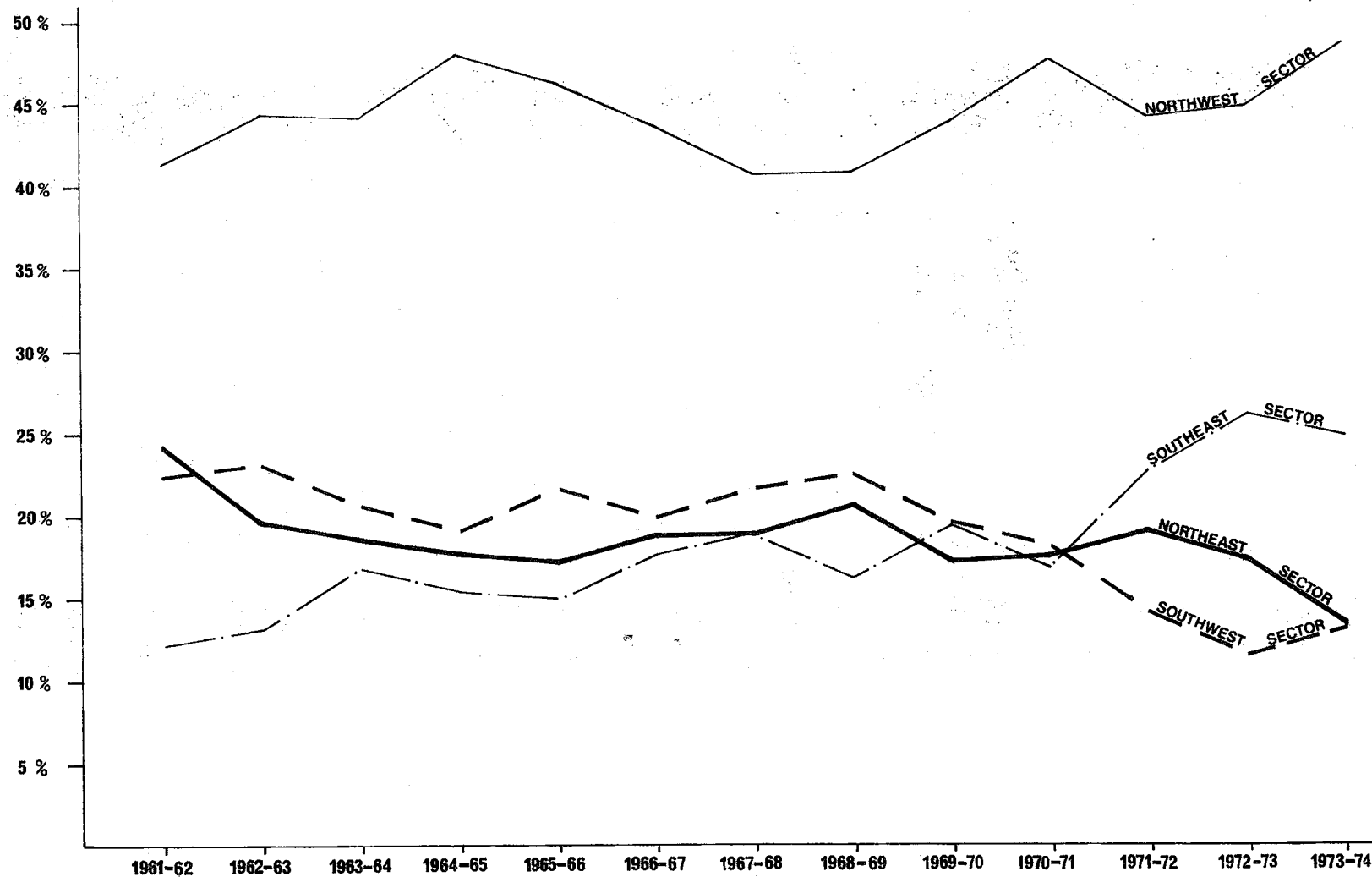


DIAGRAM 10.
HOUSING COMPLETIONS BY SECTOR
PERCENT CAPTURE OF REGIONAL MARKET
1961 - 1974

SOURCE : A.B.S.
U.S.C. 1974.

North East Sector

This sector contained 17.5 percent of the metropolitan housing inventory in 1971. Ninety one percent were separate houses, 3 percent self contained flats and 6 percent other units. From 1961 to 1973, the sector captured 18 percent of all new housing units completed in the Perth Region. The capture rate fluctuated between a high of 24.2 percent in 1962 to a low of 13.3 percent in 1973.

South East Sector

In 1971, this sector contained 14.9 percent of the Perth Region's housing inventory. Eighty two percent were separate houses, 11 percent self contained flats and 7 percent other units. From 1961-1970, this sector captured approximately 14 percent of the new housing constructed in the Region and between 1970-1973, this capture increased to 25 percent.

These figures indicate a strong preference for establishing new households in the north west sector. A continuation of these trends which correlate strongly with population growth in the four sectors, indicates that the north west sector particularly the Wanneroo Shire, can be expected to capture a significant proportion of new housing development. Table 19 shows the increase in the number of dwelling units by local government area between 1966 and 1973. It demonstrates the growth in the outer rings of the four sectors and pinpoints the tremendous growth experienced in the Shire of Wanneroo since 1966 and particularly since 1971. It also demonstrates the growth of the outer rings of the south east sector and the decline in the growth of new dwelling units in the south west sector.

5.3 The Potential for Residential Growth in the North West Sector

The north west sector (particularly the Shire of Wanneroo) can be expected to capture a significant proportion of the demand for new dwelling units. A detailed projection of the demand for new housing units will be undertaken in conjunction with the market analysis scheduled for Stage III of the Mindarie Studies.

Table 20 shows the growth in residential building completions in the Shire of Wanneroo relative to the north west sector and the Perth Metropolitan Region. Since 1971 it has accounted for 55 percent of all housing completions in the north west sector and 25 percent of all new housing units completed in the Perth Region.

TABLE 19

PRIVATE DWELLING UNIT TRENDS
PERTH METROPOLITAN AREA
1966-1973

SECTOR	PRIVATE DWELLINGS			AVERAGE ANNUAL CHANGE			
	(June) 1966	(June) 1971	(Dec.) 1973	1966-1971 No. %		1971-1973 No. %	
NORTHWEST							
Perth	29576	31731	32329	431	1.5%	239	0.8%
Wanneroo	1032	2811	9590	355	34.5%	2712	96.5%
Stirling	31873	46055	50687	2836	8.9%	1853	4.0%
Subiaco	5808	6462	6508	131	2.3%	18	0.3%
Nedlands	6299	6578	6639	56	0.9%	24	0.4%
Claremont	2654	3063	3234	82	3.1%	68	2.2%
Cottesloe	3136	3181	3233	9	0.3%	21	0.7%
Peppermint Grove	478	470	483	-2	-0.3%	5	1.1%
Mosman Park	1804	2686	2820	176	9.8%	54	2.0%
TOTAL NORTHWEST	82660	103037	115523	4074	4.9%	4994	4.9%
SOUTHWEST							
East Fremantle	2062	2434	2460	74	3.6%	10	0.4%
Fremantle	7035	7635	7898	120	1.7%	105	1.4%
Melville	13132	15480	16555	470	3.6%	430	2.8%
Cockburn	3887	6763	7743	575	14.8%	392	5.8%
Kwinana	1456	3157	3628	340	23.4%	188	6.0%
Rockingham	3003	4952	5692	390	13.0%	296	6.0%
TOTAL SOUTHWEST	30575	40421	43976	1969	6.4%	1421	3.5%
NORTHEAST							
Belmont	7050	8946	9450	379	5.4%	202	2.3%
Bayswater	7133	10463	11083	666	9.3%	248	2.4%
Bassendean	2721	3215	3414	99	3.6%	80	2.5%
Swan	5011	6819	7735	362	7.2%	366	5.4%
Mundaring	2758	3610	4315	170	6.2%	282	7.8%
Kalamunda	2898	5003	6195	421	14.5%	477	9.5%
TOTAL NORTHEAST	27571	38056	42192	2097	7.6%	1655	4.4%
SOUTHEAST							
South Perth	10164	11061	11483	179	1.8%	168	1.5%
Canning	6219	9562	11259	669	10.8%	679	7.1%
Gosnells	3215	6117	9095	580	18.1%	1191	19.5%
Armadale- Kelmscott	2288	4442	6413	431	18.8%	788	17.8%
Serpentine- Jarrahdale	504	512	533	2	0.3%	16	0.3%
TOTAL SOUTHEAST	22390	31694	38803	1861	8.3%	2842	9.0%
GRAND TOTAL	163196	213208	240494	10001	6.1%	10912	5.1%

Source: ABS USC 1974

TABLE 20

RESIDENTIAL BUILDING
SHIRE OF WANNEROO
1961-1974

	TOTAL NO. OF HOUSING UNITS			
	1961	1966	1971	1974*
Perth Metropolitan Region	135,457	163,196	212,429	243,361
North West Sector	70,307	82,660	103,037	116,925
Shire of Wanneroo	365	1,032	2,811	10,498

	ANNUAL GROWTH IN HOUSING COMPLETIONS					
	1961-1966		1966-1971		1971-1974*	
	No.	%	No.	%	No.	%
Perth Metropolitan Region	5,547	4.1%	9,247	6.0%	11,248	5.3%
North West Sector	2,470	3.5%	4,075	4.9%	5,050	4.9%
Shire of Wanneroo	133	36.6%	356	34.5%	2,795	99.4%
Completions in Wanneroo as Percentage of Perth Region		2.4%		3.6%		24.9%
Completions in Wanneroo as Percentage of North West Sector		5.4%		8.7%		55.4%

Source: ABS USC, 1974

* to March

It is considered likely that these trends will continue because of the quality, quantity and accessibility of available land in the outer ring of the north west sector and because this sector offers additional benefits such as proximity to the coast and to proposed recreation and community facilities.

5.4 Implications for Mindarie

Table 21 projects the growth in households in the Shire of Wanneroo and at Mindarie to 2001. These projections assume that household sizes in Wanneroo will decline gradually from 3.55 persons in 1974 to 3.25 persons in 2001. By the end of the development period (taken as 2001) it is estimated that there will be 95,300 households in the Shire of Wanneroo, 22,300 of which will be located at Mindarie. It is also expected that the number of

TABLE 21

HOUSEHOLD PROJECTIONS
MINDARIE ENVIRONMENTAL CITY
1974-2001

	1974	1976	1981	TOTAL HOUSEHOLDS		1996	2001
				1986	1991		
Perth Metropolitan Region	220,800	236,900	282,500	335,500	399,200	470,050	548,700
North West Sector	106,700	114,600	134,600	157,000	183,400	212,500	246,400
Shire of Wanneroo	7,600	10,200	20,100	32,100	48,300	69,200	95,300
Mindarie Environmental City	-	-	1,450	4,000	9,600	15,800	22,300

Source: USC, 1974

housing units constructed will exceed by 5-10 percent the number of households in the area, especially during the early to middle stages of development when building activity is high. Several factors will influence the demand for housing at Mindarie.

These will include:

- the rate at which development in the north west sector proceeds
- the competitiveness of land prices and/or housing units offered
- the availability of services, community facilities and recreational outlets to intending residents
- the quality of the development vis-a-vis surrounding areas
- its accessibility and the availability of transportation services to the CBD
- the availability of local or easily accessible employment

Planning of the residential precincts will be aimed at meeting detailed environmental criteria. Some of the factors such as the rate of overall development within Mindarie and in surrounding areas, the construction of major road links (e.g. the Mitchell Freeway) and the demand and availability of public transport and community facilities cannot be accurately predicted at this point in time. Subsequent chapters establish goals and desirable standards for their development but these will need to be the subject of periodical review to respond to changing economic and community standards as development occurs.

5.5 Residential Criteria

Residential development will form the largest single land use category at Mindarie. The supply of housing, its form and character, will be of major importance to successful development and a prime means towards fulfilment of Mindarie's environmental objectives. It is expected that much of the development will occur at current overall densities, with most of the housing as privately constructed, single family dwellings. However, consumer preferences may change over time and planning for residential areas should be capable of response to developing market trends.

It is important for the development plan to allow freedom of design, flexibility of layout and variation of density. Without prejudice to these basic principles, the plan assumes an average overall density of 8-10 households per hectare and allows variation for a wide range of housing types and residential environments.

Variety in housing will ensue from the ability to respond to varying locations, site conditions and market requirements. For example, land of high environmental quality may be developed with large lots and low densities; some areas may be devoted to "town house" or "patio" house types, while at the town centre, a more closely grouped "urban" form of housing may be appropriate.

Variety will be enhanced if development is undertaken by various development companies in accordance with the overall plan, under "farm out" arrangements. Variety in ownership and price will also be provided through the inclusion of the State Housing Commission in development activity. In addition, provision will be made for single and aged groups as requirements are ascertained.

The variety of housing available will be sufficiently wide to encourage people of different incomes and backgrounds to settle at Mindarie. A "balanced" community would encourage contact between different groups while allowing separate identity between areas. Ideally, centres at which social and community services are available should be located so as to provide for the needs of several adjoining localities and groups.

5.6 Goals for Residential Development

Design of subdivision areas will be in response to environmental and aesthetic parameters set out in the Environmental Study. The "environmental" objectives of Mindarie will be enhanced by careful attention to conservation of existing vegetation, an objective which would also benefit from a more flexible approach to certain statutory requirements, such as those affecting road and servicing alignments, setbacks etc.

Environmental quality in residential areas will derive from the safety and nuisance-free characteristics of the street pattern and "environmental areas" are proposed which are not traversed by through traffic. Fig. 6 indicates the "environmental area" concept; it is emphasised that these areas in no way represent "neighbourhoods" or "communities"; they represent only identifiable areas of minimum traffic intrusion. They need not be of a particular size or population and may be grouped in different combinations for various purposes. Several may be served by a single centre, high school or other facility.

Road and street layout will facilitate ease of movement by pedestrians and bicycles and allow ready access between housing, service or community areas and public transport. Local open spaces will be provided in response to local statutory requirements and environmental considerations.

Subdivision and housing design will be studied in greater detail as development proceeds. Variety in density and layout will be enhanced if it is recognised that the requirements of servicing authorities, the Town Planning Board, the Lands Department and the Local Authority often combine

to preclude flexibility in layout and site design. It is suggested that, subject to an agreed detailed plan, variation in lot size, road reserve, setback, and other requirements be allowed for specific development areas.

ENVIRONMENTAL AREA CONCEPT

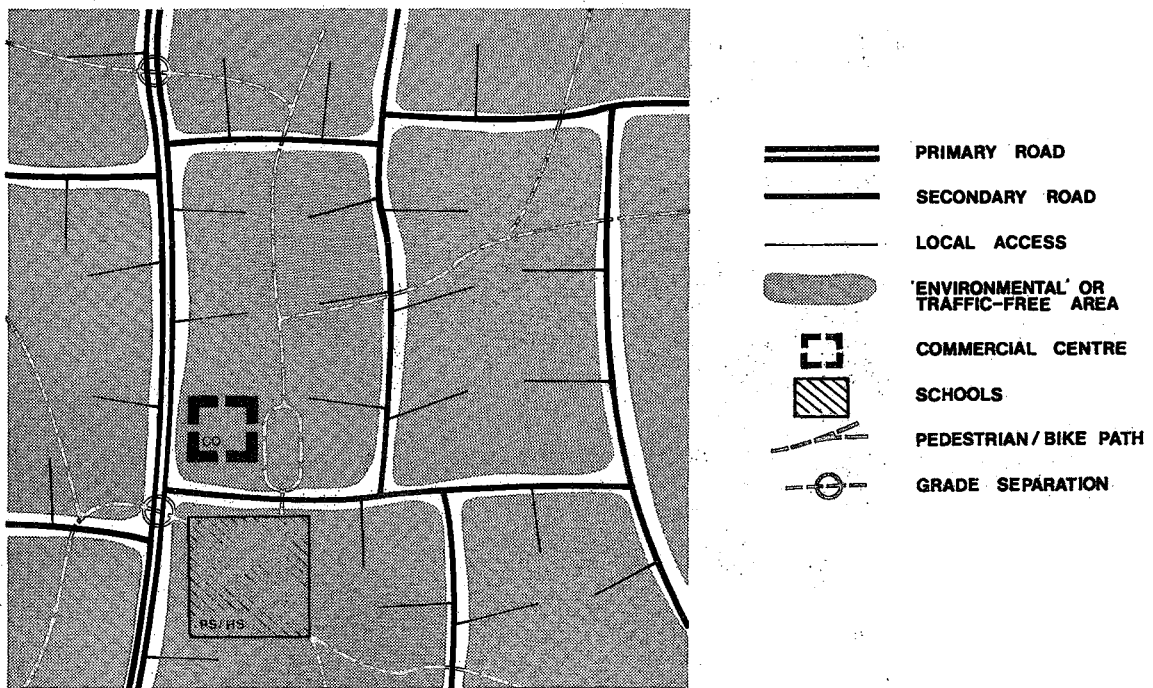


Fig. 6

6 Transportation and Movement System

6. TRANSPORTATION AND MOVEMENT SYSTEMS

The term 'movement system' is employed in this study to describe the total flow of people, goods and vehicles within Mindarie by both mechanical and unpowered means. In developments such as Mindarie Environmental City, no single system of transport will provide for all the movements involved and co-ordination between public, private, mechanical and pedestrian systems is required.

The movement system at Mindarie is of course part of the overall Regional pattern and decision making is in the hands of several authorities. Planning for movement within Mindarie must therefore be in accordance with Regional plans and objectives and in some cases will depend on the results of current studies being undertaken, for example with regard to the role of a sub-regional centre at Joondalup or in connection with proposals for extension of fixed-rail public transport.

The structure plan evolved in "Mindarie Environmental City" indicated basic land uses and a broad circulation system for Mindarie. This chapter refines and extends the analysis to produce a more detailed movement system. It begins with an outline of the goals for movement in Mindarie and examines the nature and demand for movement.

6.1 Movement Goals

The movement goals for Mindarie are derived from the demands of the public as individual users of the movement systems, and from the general standards of the community at large.

User goals can be categorised as follows:

- to provide a high degree of accessibility and service between all land use activities and places within Mindarie and the Perth Region
- to ensure swift, safe, convenient and economical movement
- to allow travellers a reasonable freedom of choice between public or private modes of travel
- to provide for a high quality public transport system in response to Regional requirements, especially in the initial stages of development, to serve those dependent upon it and to offer those who may use it an alternative to private travel
- to allow the use of the private motor car without congestion

- to reduce aggravation to the public by way of accidents, noise, operating costs and travel time
- to provide free and safe movement for pedestrians and cyclists

Community based movement goals are:

- to promote economic growth by encouraging new development and expansion
- to ensure environmentally attractive routes, minimising noise and air pollution
- to exclude through traffic from residential precincts as far as is practicable.

6.2 Generators of Demand for Movement

The evolution of the overall pattern of movement in and around Mindarie is dependent on the nature of, and demand for, physical interaction between complementary land use activities. Although regional and local journey patterns will be extremely complex, there are six major land use categories which will generate the bulk of traffic. These are the spatial distribution of industry, wholesale centres, shops and retail centres, offices and public buildings, schools and dwellings. They will also determine journey characteristics such as trip length, volume, frequency and mode. Overlying these basic movements will be journeys of a more random nature such as to the theatre, to the beach, doctor, football ground or other social destination.

Demand for movement, at a regional and local level, is the essence of transport proposals. Peak hour demands will place the greatest load on the transport system and are therefore used to establish the final design pattern and capacity. Demands for movement at other times of the day will not be significant in comparison.

6.3 Motor Traffic and the Pattern of Movement

The future traffic flows for the Perth region and the north west corridor can be projected and inferred from the forecasts of the number of vehicles. The Perth Regional Transport Study 1970 (PERTS) and the Main Roads Department (1974) have each forecast the total regional car population for the 1990s. Forecasts range from 680,000 to 688,500 vehicles on the road. The future number of private cars in the north west corridor including Mindarie Environmental City are also arrayed below.

PROJECTED POPULATION (NORTH-WEST SECTOR)	VEHICLE ^{*)} OWNERSHIP (PER PERSON)	NUMBER OF VEHICLES
341,200	0.39	133,000
380,520	0.43	164,000
490,300	0.5	245,000

* PERTS 1970

Source: USC 1974

In the 1971 census, 95.5% of all households in Wanneroo Shire had one or more cars, while for the City of Stirling, 85% of all homes had one or more vehicles. It is expected that similar car ownership trends will continue throughout the whole development period at Mindarie, giving a general high level of car ownership and personal mobility.

In addition to increases in the number of vehicles; increases in the usage of vehicles (that is traffic) are likely to be in a greater proportion. PERTS (1970) anticipates that "the number of vehicle trips will grow to three times the 1966 level" while "the total vehicle miles of travel will increase to nearly four times as a result of the growth in the numbers of long (regional) trips." **

The regional land use areas, existing and proposed, are indicated on Fig. 7. Together with current planning policy, the main emphasis of population growth, increasing vehicle ownership and personal mobility, is on development and movement along a north-south axis.

The major demand for movement generated by development at Mindarie will be for journeys to and from work, shopping journeys, and industrial, commercial and business journeys. In addition, social and recreational movements, journeys to school, and many other casual and less regular movements will take place. However, together these will not radically affect the bulk peakhour movement pattern.







At the 1971 journey-to-work census,*** 22.5% of workers in Wanneroo travelled to the Perth Central Business District, while for the northern-most collector's districts of Stirling, 30% of workers were attracted to the central area. Ten percent of workers in both

** Perth Regional Transportation Study, 1970

*** Australian Bureau of Statistics

PROPOSED PRIMARY TRANSPORT SYSTEM MINDARIE ENVIRONMENTAL CITY

Region Scheme Boundary

-  URBAN
-  URBAN DEFERRED
-  PARKS AND RECREATION
-  MINDARIE ENVIRONMENTAL CITY
-  EXISTING ROADS
-  PROPOSED ROADS

Yanchep

Quinns Rocks
MINDARIE

INDIAN
OCEAN

Whitfords

Scarborough

City Beach

FREMANTLE

Coogee

EAST WEST ARTERIAL

NORTH WEST
CORRIDOR

Lake Mariginiup

Lake Jandabup

WANNEROO

Lake Gnangara

FREWAY

PERTH

Swan River

HWY.

NORTHERN

MIDLAND



Fig. 7

localities commuted to employment areas immediately surrounding the CBD, whereas more than 20 percent worked at dispersed locations in the north-west corridor, such as Osborne Park and Balcatta. Employment opportunities south of the Swan River attracted 21.6% of Wanneroo workers and similar proportions from Stirling. The remaining workers were employed within their respective localities.

Therefore, more than 70% of journeys to and from work were in a south-north movement. The vast bulk of these movements occurred from 7:00a.m. to 10:00a.m. and from 4:00p.m. to 7:00p.m. The workers accommodated during the initial to middle stages of development at Mindarie are likely to generate a similar commuting pattern. Later in the development programme it is possible that the proposed Lake Joondalup sub-regional centre will develop, attracting employment with subsequent effect on movement patterns.

It is also possible that industrial areas proposed at Moore River and/or Alkimos, and within Mindarie could be established with similar, if contrary impacts. Although the major land use pattern will have been restructured, the typical journey to work pattern would then be north and south from Mindarie along the basic north-south link, which will be maintained.

The mode of travel for workers in the north-west including Mindarie, will be split between the private motor car and public transport. PERTS (1970) predicted that for all work trips to the CBD, in 1989, public transport would capture 44% and cars, including passengers, 54%. For non-CBD trips the car will command a much higher proportion at 79% while transit services will handle 14% of movements in this category. The need will therefore exist for a regional north-south movement axis capable of handling large volumes of cars and buses in peak periods.

The regional shopping journeys for Mindarie residents will be towards the CBD and large shopping centres such as Karrinyup and Morley. A recent behavioural study of shopping patterns* in the Perth Region indicated that the median number of visits to these higher-order centres was three per month. As with the journey to work, shopping movements from Mindarie will be in a north-south direction along the Corridor.

The development of a large shopping centre at Whitfords or at Lake Joondalup offering comparison goods could also become a major attraction in the future. The planned Mindarie Town Centre will ultimately provide

* M.R. Johnston, Op. Cit. P. 42

regional shopping functions for local and surrounding residential areas and become a further major centre of traffic.

The behavioural survey also arrays the predominant method of transport to shopping centres. Shopping journeys to the CBD by bus capture 44% of movements, while the motor car caters for 39%. This tendency may continue for Mindarie shoppers, especially if parking becomes more difficult in the central area. To reach regional centres, shoppers are more inclined to use the motor car (95%). It is expected that with greater emphasis on regional shopping, north-south access will be heavily utilised, especially that catering for the motor car. The Mindarie Town Centre will require a major route to link it with its north-south shopping catchment.

Industrial, commercial and business journeys are the most difficult to analyse because of their great variety and the diverse nature, location, origin and destination of this traffic. PERTS (1970) forecast the number of weekday trips for non-home based and truck trips to exceed 570,000 by 1989 for the whole region. It is expected that the north-west sector will accommodate a substantial proportion of these trips. The Mindarie Town Centre will attract a large number of commercial trips from warehouses and wholesale centres to the south while the establishment of industrial areas north of Mindarie and the sub-regional centre at Lake Joondalup could generate technical and service links with Perth and with the Port of Fremantle. The north-south links will also need to facilitate the necessary movements between industrial and commercial zones within Mindarie itself.

A summary of north-west corridor traffic movements shows that the major peak movements, the journey to and from work, shop journeys and industrial, commercial and business trips will be along an incipient north-south axis. The volume of movement will be likely to ultimately warrant the provision of a major freeway route. Mindarie Environmental City residents will contribute significantly to the need for this and for a more basic north-south link such as the extension of Marmion Avenue.

Present Main Roads Department planning for the north-west corridor calls for the provision of two major north-south routes leading through Mindarie. These are the limited access, medium speed route of Marmion Avenue in the centre of the corridor and the controlled-access route of Mitchell Freeway, located at its eastern boundary. These routes, together with a proposed limited-access east-west route in the vicinity of Quinns Rock Road, form the primary road network for Mindarie.

6.4 Movement within Mindarie

The internal land use activities and the desire for interaction between them will determine the movement patterns within Mindarie Environmental City. The main peak load movements will be journeys to school, to local employment, to shop, and, to a more limited extent, to recreational opportunities. Of all future movement at Mindarie, more than 85 percent will have the home as either the point of origin or destination.

The volume of school trips occurring in the morning and evening will depend on the school function and size. Local primary schools will generally accommodate 700 children while secondary schools will accommodate some 1400 students. As school trips will be the most significant group of trips made by a section of the population for which the alternative of travel by car is severely limited; students will need to walk, cycle or use public transport.

Ideally, primary schools should be within easy walking distance of the home, adjacent to the open space system of pathways and/or bikeways. The movement needs of secondary and technical students will be satisfied if schools locate within easy walking distance of neighbourhood bus services.

The Mindarie convenience-shopping centres will be subject to frequent visits by the housewife. The recent Perth shopping survey concluded that, on average, 7 visits were made to a neighbourhood centre per month. Approximately 66% of these shopping trips were made by the private car while 31% were made on foot. At Mindarie the pedestrian movement system will connect with shopping sites while the roads will need to allow for quick, convenient shopper travel.

Local recreation movements will centre on the open space and leisure facilities within Mindarie, which will be linked by a interconnecting open space walkway and/or bikeway systems. Beach access and parking for the motor car will be essential along the coast. The main peaks are expected to occur during summer weekends.

6.5 Public Transport

Public transport services will be provided for in accordance with the accepted concept outlined by the Metropolitan Transport Trust. The basic tenet of the concept is to provide frequent bus services within a

half kilometre catchment or ten minutes walking distance (Fig. 8) For the north-west corridor generally this will involve two north-south routes, between the coast and Marmion Avenue and another between the latter and Mitchell Freeway. All services will centre on bus transfer terminals located at 4-5 kilometre intervals along the corridor. They will generally coincide with major activity points, such as the Mindarie Town Centre. Bus patrons destined for major points, either north or south will be able to transfer to express buses which will operate on Marmion Avenue, and eventually on the separate Mitchell Busway.

In Mindarie the recognised constraints of a narrow urban corridor and Neerabup National Park will alter the route design slightly. Routes will follow the proposed secondary road pattern and some local roads and effectively satisfy MTT criteria.

At some future date, it may be decided to provide a rapid mass transit system for the north-west corridor. Such a system would need to link together transfer stations at the corridor activity centres of Mindarie Town Centre, Burns Beach, Joondalup, Ocean Reef, Warwick and Karrinyup and the Perth CBD. The coastal topography and engineering criteria for grades and curvature restricts the likely route location to the proposed Marmion Avenue reserve for either an elevated track or underground route. A ground level rapid transit track is neither feasible, nor desirable within or alongside the Marmion Avenue reserve. The final choice between a subsurface or elevated system will require detailed studies into the economic, environmental and social impact. Other important factors will concern passenger inducement and the position of the rapid transit construction within the development time schedule. The proposed neighbourhood bus system remains efficient in serving such a regional movement alternative, collecting and distributing patrons to and from the transfer terminals.

6.6 Local Movement Systems

In accordance with current concepts, adapted to Western Australian requirements, internal movement planning proposes a hierarchy of roads serving separate and discrete "environmental areas."

The concept requires the delineation of areas which may contain residential, commercial or industrial uses, in which people can live, shop or work in reasonable freedom from the hazards of motor traffic. There may be a degree of traffic within environmental areas, but

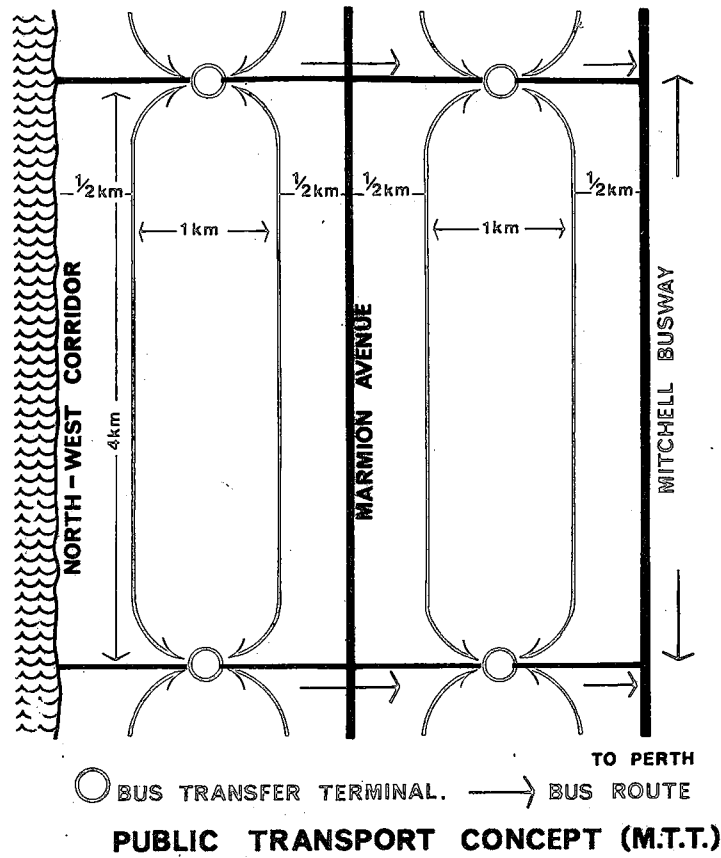


Fig. 8

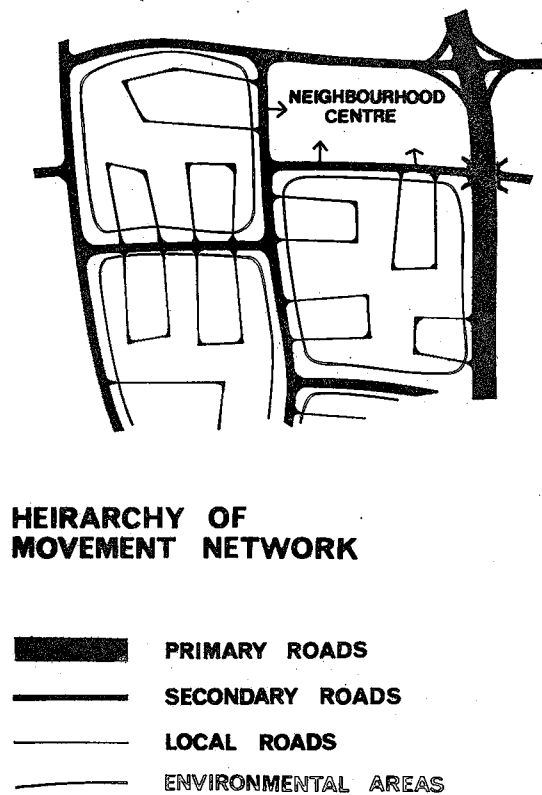


Fig. 9

in no case will extraneous traffic pass through them without sufficient divergence to encourage easier passage along a perimeter main road. The design of environmental areas will ensure that traffic is related in character and volume to the environmental and social conditions being sought for each area. For example, a shopping precinct would have a much higher level of tolerance and therefore, of traffic movement, than a residential areas.

Servicing the environmental areas will be a hierarchy of movement networks. Secondary roads will enable the efficient collection and distribution of motor traffic and public transport patrons between environmental areas and the primary arteries. The remaining movement within environmental areas will be via local service roads and pedestrian walkways and/or bikeways. Fig,9 illustrates the hierarchy and concept of environmental areas.

Within Mindarie, the secondary road function and design is basic to the success of environmental areas. They must canalise the longer movement, to skirt environmental areas yet maintain the maximum ease of movement and accessibility within the City. In all cases, secondary roads have been designed to provide optimum connections with the primary transportation network, thereby reducing trip length of the internal travel. To enhance road safety at intersections staggered T-junctions have been proposed. Fig. 10 indicates the secondary roads in Mindarie.

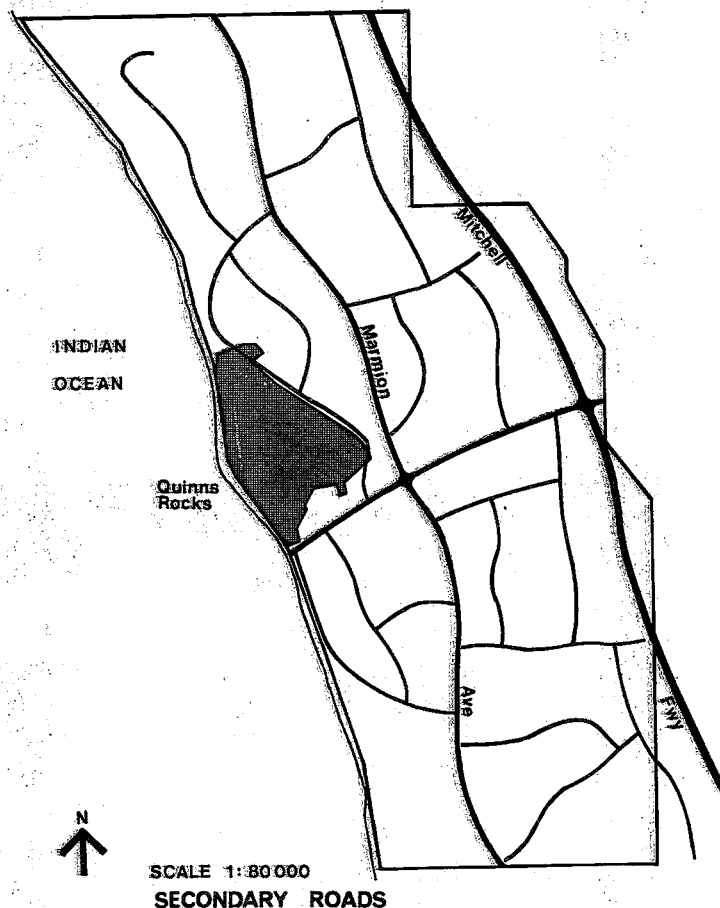


Fig. 10

Local service roads will provide direct access from secondary roads to individual buildings, in environmental areas. Subdivision design should allow vehicular access to private garages, shops or factories while retaining maximum safety and environmental quality. Adequate street or off-street parking will be provided leaving the street clear of obstructions.

For those environmental areas adjoining either Marmion Avenue, Mitchell Freeway or the east-west arterial route, it is desirable to have a parallel frontal road for aesthetic reasons and for ease of movement.

Lowest in the movement hierarchy are pedestrian walkways and/or bikeways. Entirely separate, where practicable, from vehicular routes, they will link places generating foot or bike traffic, such as schools, open space and neighbourhood shopping centres, with residential areas. Where primary and secondary roads cross pedestrian routes, under or over-passes will be planned as appropriate. (Fig.11).

Where primary routes affront environmental areas, frontage or slip roads should be provided, to aid accessibility.

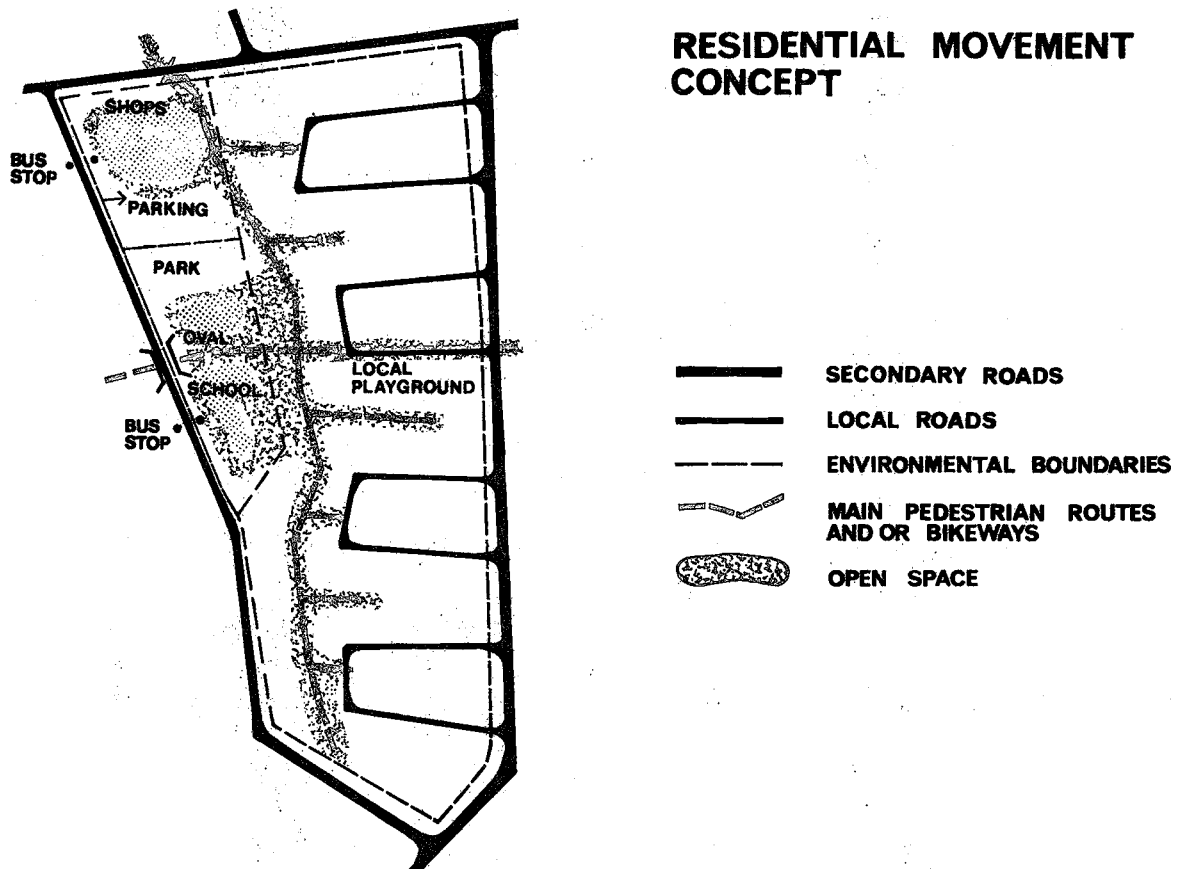
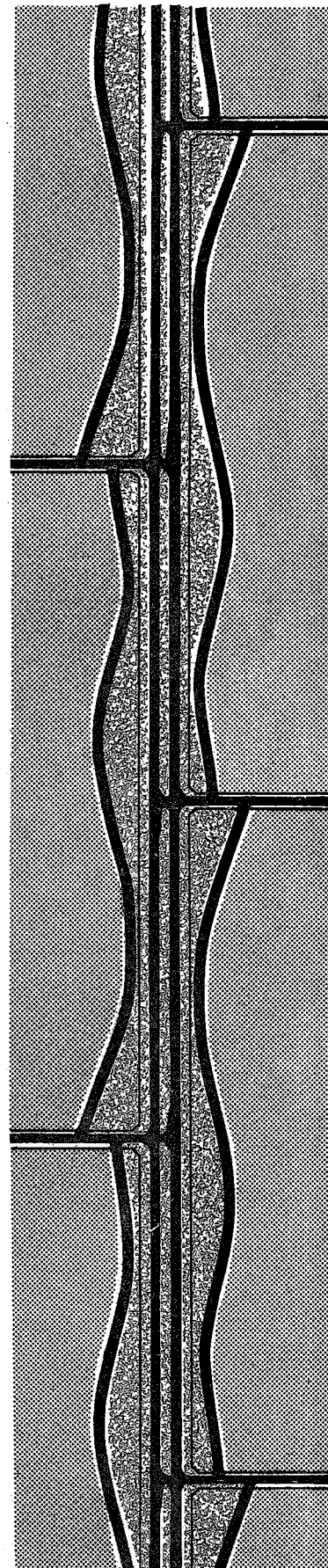


Fig. 11

Their provision will also remove the possibility of unsightly back fences abutting the primary routes. Designed within the controlled access and freeway road reserves they should be discontinuous and connect with secondary roads as T-junctions (Fig. 12).



**FRONTAGE ROAD
CONCEPT**
LANDSCAPING TO
PRIMARY ROUTE

Fig.12

7 Retail Potentials and Community Centres

7. RETAIL POTENTIALS AND COMMUNITY CENTRES

The recent housing growth in the Shire of Wanneroo together with proposed residential developments at Mindarie and elsewhere in the Shire will generate a strong demand for strategically located shopping facilities.

The projected scale of development at Mindarie (both in terms of land area and estimated population) plus its central location within the Shire of Wanneroo provide appropriate conditions for creating a regional shopping focus and convenience shops at the neighbourhood level.

The Mindarie site forms one of the trade areas or catchments for the calculation of shopping potentials, while the entire Shire of Wanneroo (inclusive of Mindarie) provides the larger framework for the measurement of ultimate regional shopping potentials. We have considered the provision of shopping facilities at several levels of hierarchy.

7.1 Types of Shopping Facility

Regional Centre

The Regional Centre provides for general merchandise, apparel, furniture and home furnishings in full depth and variety. It is built around a department store or stores as the principal drawing power. In size, the regional centre has an average range of between 200,000 and 800,000 square feet of gross leasable area. Normally about one-third to one-half of the total gross leasable area is devoted to department stores.

Community Centre

This type of centre is built around a junior department store, discount or variety store and a supermarket as the major tenants. It generally provides convenience goods, personal services and a range of soft lines (clothing) and hardlines (hardware and appliances). In size, the community centre generally has an average gross leasable area of between 60,000 and 150,000 square feet.

Neighbourhood Centre

The neighbourhood centre provides for the sale of convenience goods (foods, pharmaceuticals, sundries) and personal services (laundry, dry cleaning, hairdressing, etc) for the daily needs of its immediate neighbourhood. The centre is built around a supermarket, which is the principal tenant. In size, the newer neighbourhood centres in the Perth Metropolitan Region range between 10,000 and 30,000 square feet.

Corner Shops:

These are isolated shops, generally delicatessens, grocery stores or milk bars, which may be located throughout residential areas. Many of these shops are small, family operated businesses which keep flexible hours and provide a service to local residents.

Trade Area:

Each type of centre draws its customers from a trade or catchment area. This trade area is the region from which it derives the bulk of its total sales volume. Trade areas often overlap when two centres of equal size and store composition are located close to each other. This situation is liable to pose problems in achieving profitable sales levels as the two centres are competing for the same customer with the same goods. On the other hand, centres of different magnitude can successfully operate in the same trade areas by offering different goods (food versus clothing, pharmaceuticals versus furniture) and a more convenient location.

For a neighbourhood centre, the typical trade area might be a five minute time/distance zone, while a regional centre might attract customers from as far as 20 minutes away. In identifying the total trade area, typical considerations would include driving time, natural and man-made barriers such as coastlines, rivers, swamps, and railway lines. The location, size and strength of competitive retail centres and the expected drawing power of the major stores of the centre are also relevant to identifying trade areas.

7.2 Criteria for Successful Development

Shopping Centre Supports:

In broad terms, the viability of any centre, regardless of size or type, is dependent upon the relationship and magnitude of the following set of variables within the centre's trade area.

i. Population

A shopping centre is a viable operation because people generate demand by spending money there on goods and services. The relationship between people and shopping centres is direct; the more people the more (or larger) centres. To establish a proposed centre's feasibility, the amount of people (potential customers) within that centre's trade area must be calculated. There are various rules-of-thumb and standards for relating the trade area population to the potential size and type of centre.

In general the following criteria would apply:

<u>Type of Centre</u>	<u>Trade Area Population</u>
Neighbourhood	5,000 - 15,000 persons
Community	20,000 - 40,000 persons
Regional	80,000 - 150,000+persons

Population is a variable. In areas that are on the leading edge of residential development within the Metropolitan Region, the present population base may be just emerging and only capable of supporting a small neighbourhood facility. However, in the future, continued building activity may have increased the population base to a level where a larger centre is not only feasible, but is required by the local populace. Conversely, a loss in population can create obsolete and uneconomic retail space.

ii. Income and Expenditure Patterns

The sales which can be achieved in a proposed shopping centre depend to a major extent on the amount and pattern of retail expenditures made by trade area residents. In turn, expenditures are a function of the income levels prevailing in a trade area.

In general terms, convenience items are inelastic. As income levels rise, the percent of expenditure, relative to gross income, declines. The total amount spent for convenience goods increases with income, as families begin to buy better quality, more expensive items, and add specialty items to their purchases. Comparison goods are subject to different expenditure patterns, with higher income households spending a higher proportion of their earnings as well as a higher dollar amount for these items than the average household. Since higher levels of total retail expenditure are achieved in upper income neighbourhoods, the size of a centre and its range of goods could be greater in an upper income trade area than in an area of lower incomes.

iii. Location

Since a retail centre is a competitive operation, every advantage must be optimised for each centre. Location of the centre, especially one with larger facilities and a more extensive trade area, is a critical factor. The site must be visible from a major highway, with good access from all directions. It is helpful if the site is not adjacent to natural or man-made boundaries, which could limit the scale of the trade area.

Site:

The site for a centre should be large enough to accommodate the building shell, plus additional space for landscaping, building setbacks, parking, community facilities, and an increment for possible future expansion, or the inclusion of other complementary high-density uses. Commercial zoning should be available along with the appropriate headworks.

iv. The Principal Tenant

As mentioned earlier, each category of shopping centre has a different type of store as the principal tenant. Essentially it is this store which generates the force that attracts customers within the trade area to the centre. Within a Metropolitan Region there are different retail outlets selling the same type of goods. However, each outlet has a separate identity, reputation and price level which give it a position in a retail hierarchy. Generally, the best "anchor" store would be the one at the top of the hierarchy, but this should be related to the type of neighbourhood in which the centre operates. A careful understanding of the socio-economic characteristics of the prospective trade area is essential in lining up prospective tenants for any category of centre.

v. Constraints

The most common and effective form of retail constraint is the inclusion of another centre of similar scale within a defined trade area. In many respects a trade area can be considered as more or less, finite. It has loosely defined boundaries within which there is a certain expenditure potential for retail items. Competing centres may tend to disperse that potential to other centres within a given trade area.

7.3 Shopping Patterns

Since the range of shopping facilities at present located in the Shire of Wanneroo is limited, it is premature to assess in detail the retail habits of the current population. In general terms, the following patterns are the most likely to be utilised by the Shire and ultimately, Mindarie residents.

Convenience Shopping:

This is generally carried out in the most convenient location relative to the shopper's residence. Overall, consumers tend to make 85-90 percent of convenience expenditures within five minutes of their home. For specialty goods, such as meat and vegetables, long term relationships based on good and efficient service often develop between shopper and shopkeeper, thus creating

a small monopoly. The other 10-15 percent of convenience expenditures would be accounted for by purchases during working hours, or when local convenience shops are closed.

Comparison Shopping:

Evaluating the patterns of comparison shopping is more difficult as convenience (expressed in time/distance) is not an important factor.

Perth's Central Business District remains a strong attraction to comparison shoppers. According to a recent retail shopping survey, 78.8 percent of Central Business District shoppers visited department stores.* There is no other place in Western Australia offering a comparable concentration (size and mix) of comparison shopping facilities. The attraction of the Central Business District to shoppers is enhanced by the range of related facilities such as restaurants and coffee shops and cinemas as well as its arcades, buildings and activity level.

Large regional shopping centres have, in recent years, begun to capture an increasing share of metropolitan-wide comparison sales. Pedestrian crowding, lack of sufficient parking resources, and inadequately planned shopping axes have altered shopping patterns. In rapidly expanding suburban areas, distant from the Central Business District, enclosed shopping malls have attempted to ameliorate some of the deficiencies of the central city and usurped some of its traditional functions.. They offer a wide range of retail activities and provide ample space for parking.

Karrinyup Centre, a regional facility of over 400,000 square feet of gross leasable area is the major competition to the Central Business District in the north west corridor. At this point, no shopping surveys have been undertaken to determine where the greatest concentrations of support are located. However, given its location, it is logical to assume that some Wanneroo residents would find, for certain types of comparison shopping, a preference for Karrinyup. The future use of Karrinyup by Wanneroo residents will, to a great extent, be controlled by improvements and additions to the corridor's transport network and the location and scale of competition.

Since Mindarie is at the mid-point in the potential urban growth corridor of Wanneroo, it is reasonable to expect, under qualified circumstances (for example, the rate of growth and road systems planned for the Shire), that a regional centre could be successfully developed.

* M.R. Johnston and Associates "Perth Metropolitan Region Perth Shopping Survey 1973" P. 43

7.4 The Potential for Shopping and Commercial Growth at Mindarie

i. Role of Shopping Centres

Ideally, a retail shopping centre will provide not only for the material needs of the surrounding neighbourhood but will also act as a catalyst in creating a sense of neighbourhood or community identity. Opportunities for social interaction can be created in a shopping centre with careful planning and encouragement.

This approach requires that the shopping centre be viewed as a resource around which community participation can be centred. It will require a prominent location which is readily accessible by public and private transport.

In neighbourhood centres, identity can be created on a smaller scale through the sharing of facilities. Nurseries, churches and community halls can be integrated into the site design, utilise parking, and draw on other centre facilities such as open space or restaurants.

It is difficult to create a community atmosphere around a large centre if all the store windows are closed after dark and on weekends, periods of optimal social usage. Provision for night shopping can create a successful social atmosphere and create an alternative reason for visiting the centre.

ii. Mindarie Shopping Centre Potentials

The projected scale of development activities at Mindarie will necessitate a broad spectrum of retail activities. This will include traditional neighbourhood centres and a regional (town) centre as well as automobile dealerships and accessory stores, repair facilities and a host of other activities normally excluded from suburban centres. Fig. 13 shows potential commercial sites.

Tables 22, 23, 24 and 25 calculate, for regional and convenience trade areas the scale of retail potentials at Mindarie and for the Shire of Wanneroo. These calculations examine residential growth potentials, income and expenditure patterns and likely competition.

These figures will need to be substantiated and reviewed in the light of actual development programmes.

TABLE 22

DEPARTMENT STORE POTENTIAL
MINDARIE ENVIRONMENTAL CITY
1981-2001

	1981	1986	1991	1996	2001
Total Households	1,450	4,000	9,600	15,800	22,300
Average Household Income 1)	\$ 10,250	\$ 11,875	\$ 13,750	\$ 16,000	\$ 18,560
Percent Expenditure for Department Store Goods	5.2%	5.2%	5.2%	5.2%	5.2%
Average Household Expenditure for Department Store Goods	\$ 533	\$ 617	\$ 715	\$ 832	\$ 965
Total Trade Area Expenditure	\$ 772,900	\$ 2,468,000	\$ 6,864,000	\$13,145,600	\$21,519,500
Net Outflow From Mindarie at 40%	\$ 309,200	\$ 987,200	\$ 2,745,600	\$ 5,258,200	\$ 8,607,800
Total Department Store Expenditure at Mindarie	\$ 463,700	\$ 1,480,800	\$ 4,118,400	\$ 7,887,400	\$12,911,700
=====					
Total Supportable Department Store Space:					
At \$60/sf of GLA 2)	7,700 sf	24,700 sf	68,600 sf	131,500 sf	215,200 sf
At \$70/sf of GLA	6,600 sf	21,200 sf	58,800 sf	112,700 sf	184,500 sf
At \$80/sf of GLA	5,800 sf	18,500 sf	51,500 sf	98,600 sf	161,400 sf

TABLE 23

CONVENIENCE SPACE POTENTIALS
MINDARIE ENVIRONMENTAL CITY
1981-2001

	1981	1986	1991	1996	2001
Total Households	1,450	4,000	9,600	15,800	22,300
Average Household Income 1)	\$ 10,250	\$ 11,875	\$ 13,750	\$ 16,000	\$ 18,560
Percent Expenditure for Convenience Goods	18%	17%	15%	13%	12%
Average Household Expenditure for Convenience Goods	\$ 1,845	\$ 2,018	\$ 2,062	\$ 2,080	\$ 2,227
Total Trade Area Expenditure	\$ 2,675,300	\$ 8,072,000	\$19,795,200	\$32,864,000	\$49,662,100
Net Outflow From Mindarie at 10%	\$ 267,500	\$ 807,200	\$ 1,979,500	\$ 3,286,400	\$ 4,966,200
Total Convenience	\$ 2,407,800	\$ 7,264,800	\$17,815,700	\$29,577,600	\$44,695,900
=====					
Total Supportable Convenience Space:					
At \$ 90/sf of GLA 2)	26,800 sf	80,700 sf	198,000 sf	328,600 sf	496,600 sf
At \$100/sf of GLA	24,100 sf	72,600 sf	178,200 sf	295,800 sf	447,000 sf
At \$110/sf of GLA	21,900 sf	66,000 sf	162,000 sf	268,900 sf	406,300 sf

1) Expressed in 1974 Constant Dollars

2) GLA = Gross Leasable Area

Source: USC 1974

TABLE 24

DEPARTMENT STORE POTENTIALS
SHIRE OF WANNEROO
1974-2001

	1974	1976	1981	1986	1991	1996	2001
Total Households	7,800	10,200	20,100	32,100	48,300	69,200	95,300
Average Household Income 1)	\$ 8,550	\$ 9,000	\$ 10,250	\$ 11,875	\$ 13,750	\$ 16,000	\$ 18,560
Percent Expenditure for Department Store Goods	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
Average Household Expenditure for Department Store Goods	\$ 445	\$ 468	\$ 533	\$ 617	\$ 715	\$ 832	\$ 965
Total Potential Expenditure for Department Store Goods	\$ 3,476,900	\$ 4,773,600	\$10,713,300	\$19,805,700	\$34,534,500	\$57,574,400	\$91,964,500
Net Outflow From Trade Area at 40%	\$ 1,390,800	\$ 1,909,400	\$ 4,285,300	\$ 7,922,300	\$13,813,800	\$23,029,800	\$36,785,800
Total Trade Area Expenditures for Department Store Goods	\$ 2,086,100	\$ 2,864,200	\$ 6,428,000	\$11,883,400	\$20,720,700	\$34,544,600	\$55,178,700
=====							
Total Supportable Department Store Space:							
At \$60/sf of GLA 2)	34,800 sf	47,700 sf	107,100 sf	198,100 sf	345,300 sf	575,700 sf	919,600 sf
At \$70/sf of GLA	29,700 sf	40,900 sf	91,800 sf	169,800 sf	296,000 sf	493,500 sf	788,300 sf
At \$80/sf of GLA	26,100 sf	35,800 sf	80,400 sf	148,500 sf	259,000 sf	431,800 sf	689,700 sf

TABLE 25

CONVENIENCE SPACE POTENTIALS
SHIRE OF WANNEROO
1974-2001

	1974	1976	1981	1986	1991	1996	2001
Total Households	7,800	10,200	20,100	32,100	48,300	69,200	95,300
Average Household Income 1)	\$ 8,550	\$ 9,000	\$ 10,250	\$ 11,875	\$ 13,750	\$ 16,000	\$ 18,560
Percent Expenditure of Convenience Goods	19%	19%	18%	17%	15%	13%	12%
Average Household Expenditure for Convenience Goods	\$ 1,625	\$ 1,710	\$ 1,845	\$ 2,018	\$ 2,062	\$ 2,080	\$ 2,227
Total Trade Area Expenditure for Convenience Goods	\$ 12,671,100	\$ 17,442,000	\$ 37,084,500	\$ 64,777,800	\$ 99,594,600	\$143,936,000	\$212,233,100
Net Outflow From Trade Area at 20%	\$ 2,534,200	\$ 3,488,400	\$ 7,416,900	\$ 12,955,600	\$ 19,918,900	\$ 28,787,200	\$ 42,446,600
Total Trade Area Convenience Expenditures	\$ 10,136,900	\$ 13,953,600	\$ 29,667,600	\$ 51,822,200	\$ 79,675,700	\$115,148,800	\$269,786,500
=====							
Total Supportable Convenience Space:							
At \$ 90/sf of GLA 2)	112,600 sf	155,000 sf	329,600 sf	575,800 sf	885,300 sf	1,279,400 sf	1,886,500 sf
At \$100/sf of GLA	101,400 sf	139,500 sf	296,700 sf	518,200 sf	796,800 sf	1,151,500 sf	1,692,900 sf
At \$110/sf of GLA	92,200 sf	126,900 sf	269,700 sf	471,100 sf	724,300 sf	1,046,800 sf	1,543,500 sf

1) Expressed in 1974 Constant Dollars

2) GLA = Gross Leasable Area

Source: USC 1974

Assuming development will have commenced by 1977 the approximate total supportable space at Mindarie would be as follows:-

YEAR	CONVENIENCE	COMPARISON*
1981	24,000 s.f.	6,500 s.f.
1986	73,000 s.f.	21,000 s.f.
1991	178,000 s.f.	59,000 s.f.
1996	296,000 s.f.	113,000 s.f.
2001	447,000 s.f.	184,500 s.f.

* Department Store

A further support factor, which is not taken into account in these calculations, would be the proportion of the population from outside Mindarie which is attracted to the Mindarie Town Centre.

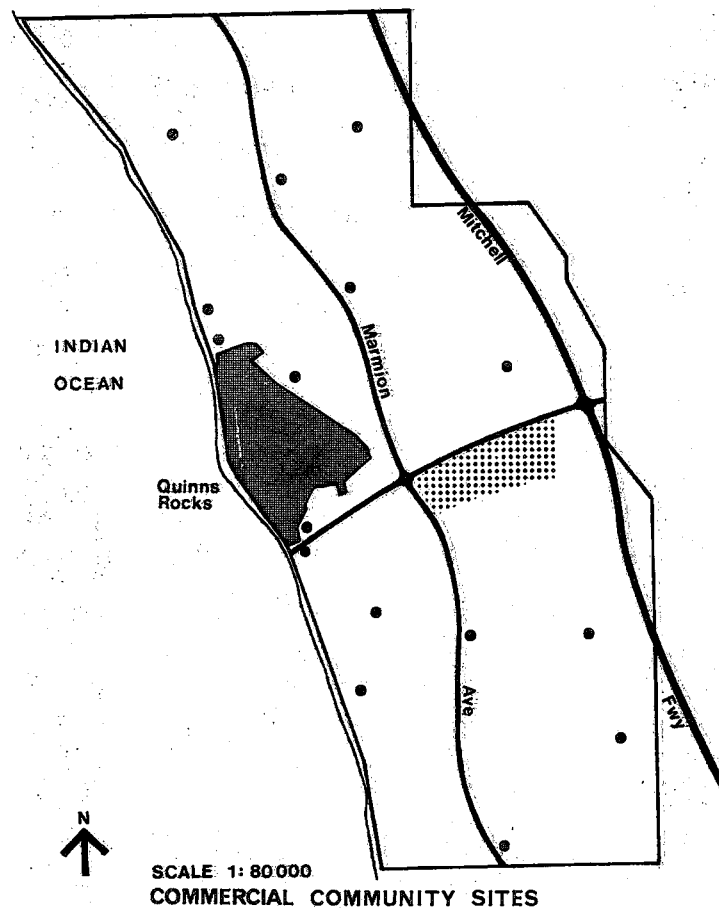


Fig. 13

Neighbourhood Centres:

For each incremental gain of 1,500 households, a convenience centre of approximately 20,000 square feet should be provided.

This number of households, given projected income levels and convenience expenditure patterns will provide the volume of retail sales necessary to support 20,000 square feet of shopping centre space.

The allocation of 20,000 square feet is optimal size for present day tenant requirements (although this may be altered upward in later years as retailing strategies require additional floor space). The principal neighbourhood centre tenant, a supermarket, requires from 8,000 to 12,000 square feet of gross leasable floor area. The residual space is sufficient to provide for:-

- Butcher
- Greengrocer
- Newsagent
- Restaurant
- Drycleaner
- Branch Bank
- Male and Female Hairdresser
- Delicatessen & Fruit

Public and community facilities such as kindergarten/nursery schools, churches, and community halls would also be incorporated in the site design as appropriate.

Community and Regional Centre Strategy:

The size and location of Mindarie coupled with the growth potential of the north west corridor, lend strong support to the eventual development of a regional centre by the end of the development timetable.

It is important for the development, at an early stage, to establish a community focus. A central location has been allocated for the regional centre and a thorough shopping and development strategy will be formulated and integrated into the planning framework when the Stage III (Market Studies) are undertaken in detail.

There are a number of strategy alternatives that can be selected and each will be measured against market opportunities or constraints and "bottom line" financial returns.

One of the most obvious strategy alternatives would be to:

- Select the optimal regional centre site and allocate a total amount of land to commercial development.
- Begin the first phase of residential development nearby.

- Construct the first neighbourhood centre on the regional site. Provide community facilities (nursery, church).
- As the Mindarie population increases, add the appropriate tenant mix to create a community centre. Establish a higher order of community facilities (Post Office, library, community centre). The timing for this expansion would be detailed in the development program.
- Look to the development of other high density uses adjacent to the centre such as garden or medium density home units and apartments and commercial office space.
- When the combined Shire and Mindarie populations reach the appropriate scale, augment the community facility with the addition of major department store space and create a regional centre. Again, the timing of this element would be clearly shown in the development program.

As more detailed marketing and financial data become available other alternative strategies will emerge to be tested against ultimate development goals and resources.

Town Centre Concept:

Initial concepts for Mindarie Town Centre have been illustrated in a separate document. The design system which has been evolved will permit the Centre to expand as the population grows and the demand for additional space arises. It is intended that the centre be primarily a place for pedestrians and that it shall involve all levels of activity. Fig.14 illustrates the proposed concept and the range of activities which will be incorporated within the centre.

iii. Commercial Potentials

Opportunities for development of other types of high density land uses exist adjacent to the Town Centre. These uses would be identified, and appropriate scales designated after specific marketing studies have been undertaken. These other uses might include, but not be limited to:

Hotel
Tourist Motel
 Licensed Tavern

Office
Private
 Government
 Medical Suites
 Dental

MINDARIE TOWN CENTRE CONCEPT

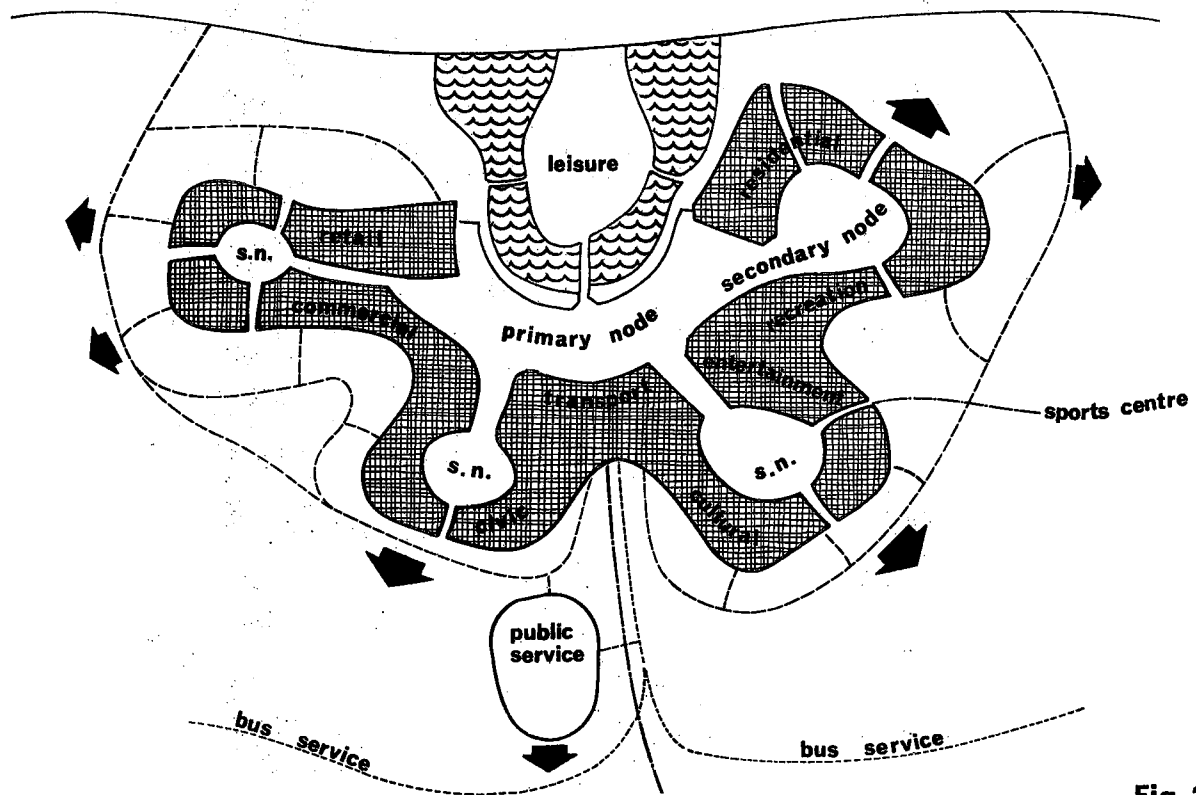


Fig. 14

Residential
Home Units
Flats

Retail
Petrol Stations
New and Used Car dealerships
Accessories for motor vehicles
Boats, outboard motors, caravans
Antiques, second-hand goods
Cinema and theatre
Nurserymen and florists

Office:

The future of large-scale office development at Mindarie depends to a great extent, on government decisions as to the feasibility, size, timing and location of the proposed Lake Joondalup centre. The growth of population in the Shire of Wanneroo (and Mindarie) will generate certain public and private demand for office space to serve local needs.

The actual determination of office space demand will require a separate market study. However, it would be reasonable to expect that employment generated by residential development at Mindarie could be accommodated, in some degree, by office facilities closely integrated with the Town Centre.

Other Retail:

In many suburban shopping centres certain retail functions are excluded. Some of these require large land areas for showrooms or storage, and are considered to be of marginal economic value. Population pressures in the northwest corridor coupled with long driving distances to Perth will, however, generate a strong desire and demand for retail facilities such as new and used car sales, automobile accessories, (tyres, batteries, etc) and repair shops. There have been recent successes in the United States in developing a "Car Shopping Centre" by providing one large central facility (storage, repair garage, etc) for many dealers. The economic benefits of providing this type of service centre make it feasible and would be worthwhile investigating for inclusion at Mindarie. Boats, caravans, recreational vehicles could also be included. Other activities often overlooked include cinemas, medical accessories and petrol stations.

Residential:

The market potential for integrating residential development of a high density nature into the town centre should be explored. Residential units could be both home units and rental flats.

Hotel:

Both a residential hotel/motel and a licensed tavern, relying on the regional population base for market support could be included in the Town Centre scheme.

8 Social Environment

8. SOCIAL ENVIRONMENT

The term "social environment" is used in this study to describe those physical and non-physical aspects of development and the relationships between them which, by serving community needs, contribute to the satisfaction and well-being of the inhabitants of the area. Over the 25 to 30 year period of Mindarie's development new community needs and attitudes are bound to emerge, while present concerns may disappear. However, it is necessary to establish optimum provision and location of such facilities as schools, playing areas, sports grounds, shopping centres, churches, community centres, hospitals and health services.

Social Institutions

To date, in most residential developments planned in the Perth Metropolitan Region, essential physical infrastructure and space for basic community facilities are provided by the developer on the basis of local requirements. Community and social patterns tend to evolve in natural response to the characteristics of the particular development and its regional context. The scale of Mindarie, however, makes it essential that facilities are planned on a community-wide basis taking account of broader requirements. Different socio-economic groups can be provided with the types of facilities most useful or necessary to them. Some of these facilities should be provided during the early stages of settlement while others require a substantial permanent population before their development becomes feasible.

The present study will establish goals and objectives for the provision of community services at Mindarie. While these goals can form a basis for decision making, the greatest impact will be created from within the community from the people moving into the area - their aspirations, interests, socio-economic status and needs for social contact will determine the sorts of institutions which will flourish and the sorts of facilities which will be most heavily utilised. Studies to predict these factors can be useful indicators of the types of facility likely to be in demand but their success will depend on community acceptance which cannot be externally imposed. For this reason it is proposed to recommend a range of facilities which could ultimately be developed at Mindarie but to reserve development until such time as the reaction

of Mindarie residents can be tested.

To some extent the purchase of land and the subsequent construction of a house at Mindarie will initiate the community development process as people of similar socio-economic status and age groups are drawn together, away from familiar environments. In many new town situations this factor has been modified by the early establishment of community associations which may help to overcome the initial feelings of isolation. Community facilities provided with the assistance of the developer should encourage these natural tendencies. Community feeling is most likely to develop and grow over time, but the facilities and services provided initially should be aimed at making the suburb a better place to live. The provision of an attractive environment with adequate playgrounds and freedom from excessive traffic rate highly with residents in new communities.*

However, the features and cost of the individual house continue to be of overriding importance in the decision to move to an area. At Mindarie where many of the initial residents will buy land and then build a house of their choice, the particular features and facilities provided in the area may be of greatest importance in influencing the decision to settle there in preference to other areas.

8.1 Goals and Objectives for Community Services

The basic objective in providing social facilities in a new community is to ensure that the process of settlement and community development is accomplished smoothly and that people in the area are not unduly disadvantaged in relation to those in nearby suburbs.

To this end efforts need to be made early in the City's development to ensure:-

- that newcomers are fully informed about available and proposed facilities and services at Mindarie so that the decision to move is made on a basis of understanding the planned rate of facility development.
- that essential facilities such as a doctor's surgery, foodshops, chemist, telephone boxes, and post boxes are provided as early in the development programme as possible.

* Robert B. Zehner
"Neighbourhood and Community Satisfaction in New Towns & Less Planned Neighbourhoods"
Journal of the American Institute of Planners
November 1971 PP. 379-385

- that social contact is facilitated by the provision of childrens playgrounds and sports grounds for older children and adults, churches, local shops and local hotels.
- that local residents can become involved in the management and provision of community services by encouraging the development of civic action groups and home owners associations.
- that childminding facilities are available to working mothers and others who may require it, perhaps manned jointly by mothers and professional personnel.
- that housing is available to a wide spectrum of people, ranging from couples with young children to older couples whose children have left home and who desire a smaller housing unit. The latter would include the parents of people settling at Mindarie which may alleviate the problems associated with the isolation and disintegration of family groups.* In addition to ensuring that the community is mixed on an age basis, a variety of housing types and densities should be located within each precinct to cater to different socio-economic groups.
- that transport facilities are available in the early phases of development to provide access from Mindarie to Perth and/or to major shopping complexes such as Karrinyup.

8.2 The Facilities and Services

i. Education

In a development the size of Mindarie, a range of education facilities and services will be in demand. These will include pre-school, primary, secondary, technical and tertiary facilities as well as special schools for handicapped children. Private as well as public schools should be encouraged to locate within Mindarie so as to provide a wider range and choice of schooling establishments for children in the area. Kindergarten and day care facilities for pre-school

* This problem is particularly prevalent amongst blue-collar families where family based activities are often the main source of social outlet. Studies undertaken in Britain have shown that when kin have moved with a family, the strains of moving to a new environment have been minimised. See Brian J. Berry "The Human Consequences of Urbanisation" MacMillan Press 1973 P 138

children will be particularly important in the early stages of development when a substantial proportion of women are likely to have pre-school age children and to be working as well.

Pre-School Facilities

Child-Care - in a predominantly young community where financial pressures may require the wife to work in order to help meet the commitments involved in establishing a household, provision should be made for formal day care centres staffed by mothercraft nurses and child care assistants. It is particularly important that these centres be sensitively designed and organised so that children can be confidently placed in them by working parents. In some cases, it may be advantageous to locate these centres close to major employment or shopping areas.

Play Groups - other, less formal, facilities need to be available for locally organised and managed play groups. A community or church hall could be successfully used for this purpose and would bring together people of similar interest and at the same time facilitate the process of settling in at Mindarie.

Kindergartens - these would provide a more structured educational facility for young children in the area generally on a half-day basis and could be used by different groups in the morning and afternoon. Ideally, kindergartens should be located close to primary schools, and areas of open space. Potential benefits of this approach would be increased flexibility in the use of buildings, facilities and staff between kindergarten and primary school, older children could take pre-school children to kindergarten and the possible future integration of preschools and primary schools would be easier.

Primary Schools - It is desirable that school sites be allocated and reserved prior to development. However, in the case of a development such as Mindarie, which will span about twenty-five years, it will be necessary to review both the physical and social aspects of policies formulated today and to relate school developments ten and twenty years hence to demographic trends.

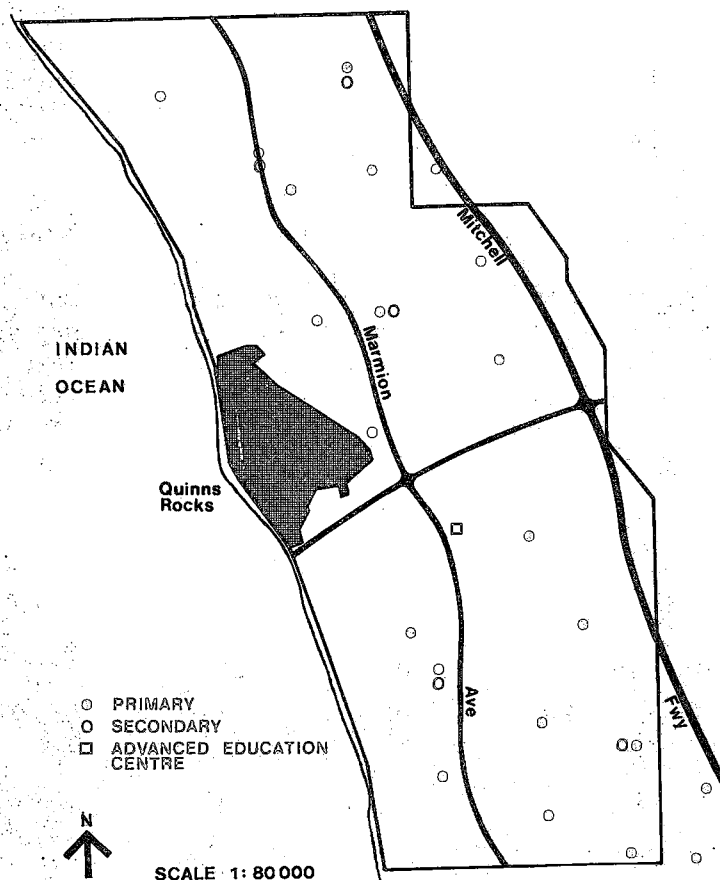
Using current Education Department Standards*, it is anticipated that Mindarie will have 22 government

* Primary school sites are assumed to occupy 3.44 hectares and to be provided at a rate of 1 per 3,500 people. Each primary school caters for some 700 students.

primary schools by the time its population nears its upper limits. Private church schools are likely to want to establish at least at the primary levels once development is underway. Interested bodies will be encouraged to discuss their requirements and negotiate with the developers at an early stage so that suitable sites can be set aside for sale to private school authorities.

Two special school sites for handicapped children, requiring approximately 4.06 hectares each have been requested by the Education Authorities. These schools will be designed to serve a catchment area of 40,000 persons, although it is anticipated that children from other areas will use these facilities if space is available.

Fig 15 , shows the schematic location of school sites at Mindarie. These sites will need to be confirmed once detailed planning commences and some relocation may be necessary to meet other site and social planning criteria. The staging and construction of each school will be determined in conjunction with education authorities and the Shire of Wanneroo and will be based on population growth.



SCHEMATIC SCHOOL LOCATIONS

Fig.15

Location Criteria

Primary schools need to be centrally located close to residential areas and preferably adjacent to public open space. The Education Department requires that they be sited away from major roads so that safe passage to and from school can be assured, and prefer locations which do not border on major shopping centres.

While these may be ideal criteria, they tend to isolate primary schools from the main stream of activity. In a new area such as Mindarie, where primary schools will be amongst the first non-residential buildings constructed, it is desirable that they be a central part of the community.

The Community School

Further investigation of the benefits of the community school approach is considered desirable. In this type of development, community facilities are clustered around the school so that they can be used by a wide range of persons. It may, for example, be socially and economically beneficial to establish the first primary school adjacent to a proposed high school site and to incorporate other facilities such as a community hall (which could be used as a gymnasium, auditorium, theatre, assembly hall), a library, music room and health centre nearby. A cafeteria, committee

rooms and small office could be added so that sporting and cultural groups may also utilise the facilities. The clustering of facilities, along the lines suggested, would reduce costs by avoiding the duplication of school and community buildings and sportsgrounds and would possibly ensure earlier provision of these facilities than if they were developed independently for single uses.

The application of these concepts would require a change in present attitudes to school development and location. For example, at present the education authorities prefer that primary schools be located away from shopping centres. However, if by implementing a system of pedestrian ways and grade separation where necessary, safety can be assured, the establishment of primary schools close to shopping areas and community facilities can be beneficial. The parking facilities provided could serve shoppers, school functions, community activities centred around the school and weekend sporting activities.

It is not suggested that all primary schools be located within community complexes, but rather, that this type of development should be carefully and comprehensively examined and a positive relationship attempted.

Secondary Schools

Mindarie will eventually have five high schools with facilities for fourteen hundred students in each. High school sites generally require ten hectares of land. It is recommended that the high schools be combined with primary schools and it has been accepted practice in this situation to allow twelve hectares for the combined facilities.

Since the major private secondary schools are already established and draw students from all over Western Australia, it is unlikely that there will be great demand from private secondary schools to locate at Mindarie in the foreseeable future. A percentage of families living at Mindarie may choose to send their children to these schools in Perth and this will reduce the potential school population.

Because the early phases of development at Mindarie are expected to attract mainly families with young children, the demand for secondary schools will occur later than for primary schools. High schools are shown on Fig. 15.

Location Criteria; Community Use

A high school needs to have good access (both pedestrian and public transport) and to be centrally located, preferably near public open space and recreation areas. High school facilities are usually tailored to meet adult standard, but at present are largely under-utilised outside school hours. To promote community use of the facilities secondary schools should be located close to a district centre where other community facilities could be expected to develop and where the activity level will tend to be high. The first secondary school at Mindarie could be located in the vicinity of the Town Centre and initial residential developments.

This approach to school location and an acceptance of the benefits of partial dual usage, would provide for a more economical use of educational facilities and sportsgrounds. The school could be used for adult education courses in the evenings and weekends and the grounds for competitive sport and training. If schools are planned on the basis that they will involve and be used by the community, the provision of comprehensive facilities including class rooms, library, hall, gymnasium, swimming pool, drama workshop, common rooms and cafeteria can be readily justified in terms of maximising both the economic and social investment. These concepts should be further investigated with the local authority and the Education Department. They could also provide a basis for the operation of a community development association, as discussed later in this chapter. Fig. 16 suggests a possible dual use arrangement for school and community facilities.

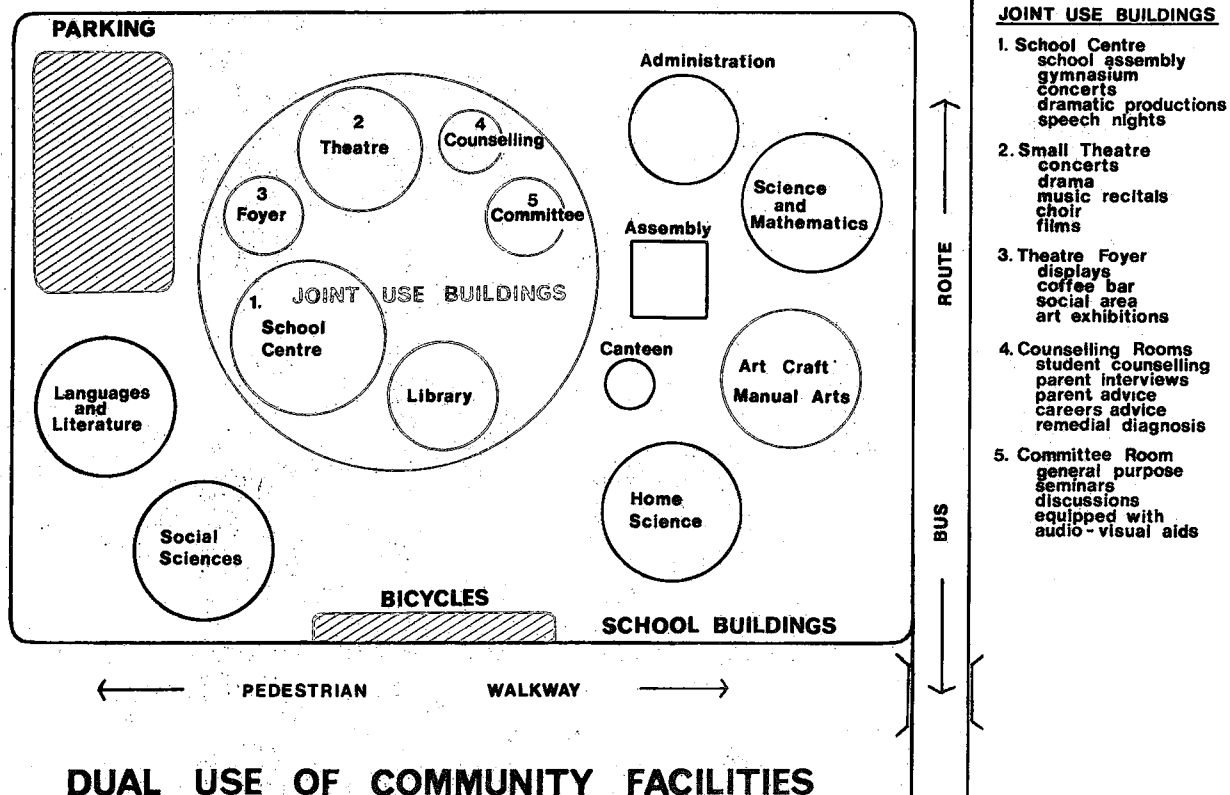


Fig. 16

Further Education

As Mindarie develops, the potential for establishing a Centre for Higher Education which incorporates various types of educational facility within a major complex should be investigated. It is anticipated that the demand for further education will continue to rise and that new centres will be needed in areas of population growth. A centre of this type could fulfil the role of providing flexible facilities for adult education and would generate employment opportunities at Mindarie.

The following categories of activity are suggested for possible inclusion:

- undergraduate university courses
- technical colleges
- vocational retraining
- teacher training

This Centre could operate in a similar manner to a College of Advanced Education and be a major focal point within the community. Proposals to set up a centre of this magnitude would need to be co-ordinated with proposals for the third university at Lake Joondalup to ensure that courses complement each other, but are not duplicated.

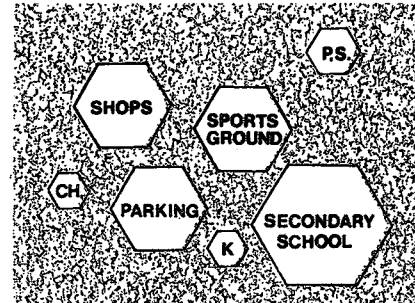
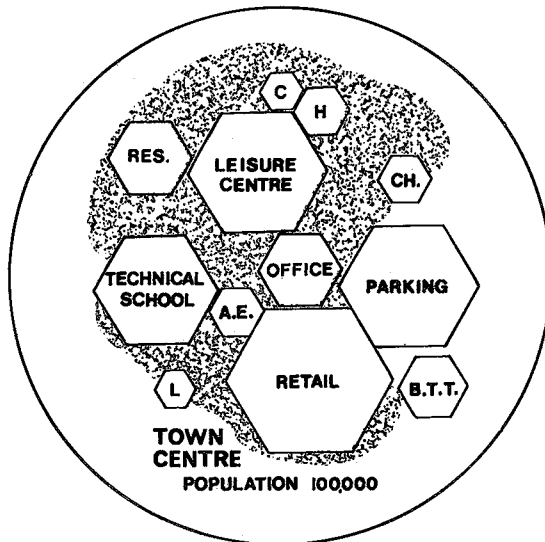
Investigations in conjunction with education authorities and experts to determine the potential for developing such a Centre at Mindarie is recommended. A complex of this type would require a large area of land which should ideally be allocated to this use early in the development process.

ii. Commercial and Community Facilities

An analysis of shopping and commercial potentials at Mindarie is included in a separate chapter. This section will be confined to an examination of the social role such centres play in the development of a new community. Fig. 17 shows concepts for the town centre and neighbourhood centres. The early development of shopping facilities is important to the growth of a new community. Initial demands centre mainly on convenience goods which are catered for in small centres serving everyday community needs. A supermarket, milkbar, bakery, chemist, newsagent etc, would be included. Such centres also serve as informal community meeting places and fulfil an essential social role for local residents. Lack of such facilities is widely acknowledged as a major source of discontent amongst residents in new areas. Corner shops selling food are also important in that they provide a service to local residents by operating with flexible hours and selling a variety of goods, often at a more personal level than larger centres can offer.

The development of a major town centre will add a new dimension to the area giving it a focal point with which Mindarie residents can identify. This type of facility is being planned, but its size and the variety of goods and services it will be able to offer will depend on government plans to establish a major centre at Lake Joondalup. A flexible approach has been adopted in the planning of the Town Centre to permit it to grow in natural stages with population growth. It is recommended that public buildings such as churches, a library, medical and dental clinics, a civic hall, theatres and taverns, together with offices and commercial facilities be located in the town centre. This will reinforce its role as a community centre by ensuring that people can use the centre at all times of the day and during weekends. In many aspects, the town centre will be a microcosm of the Perth Central Business District, serving the sub-regional population.

COMMUNITY FACILITIES



A.E. ADULT EDUCATION
B.T.T. BUS TRANSFER TERMINUS
C CLUBS
CH. CHURCH
H HEALTH CENTRE

K KINDERGARTEN AND PRE SCHOOL
L LIBRARY
P.S. PRIMARY SCHOOL
RES. RESIDENTIAL

Fig. 17

Service industries such as petrol stations, laundromats and restaurants should be located close to, or within the shopping precinct.

iii. Churches

Several sites will be set aside after consultation with church authorities to determine the likely needs, number and size of churches which could function successfully at Mindarie. Trends towards church unity should permit some sharing of facilities. This will be particularly important during the early phases of development when the population will require church facilities but will not be sufficiently large to support separate ministries. It may be possible for church groups to use other community facilities such as school or civic halls until the population warrants the construction of a church. Preliminary investigations indicate that several denominations will be interested in establishing at Mindarie. Most of the churches will be small, but the major denominations may be interested in establishing Regional facilities at Mindarie.

From a social planning standpoint, it is recommended that churches be located in the vicinity of the Town Centre or community shopping precincts. This will strengthen both the social functions of the commercial centre by creating an additional role and activity within it and the churches by ensuring that they are easily accessible and their location well known.

It is recommended that sites be reserved for all churches that express wishes to establish local ministries at Mindarie as they perform a vital social and welfare role within the community, providing a place where people of similar conviction can meet. Church based social and charitable activities also play an important role in new and ongoing community development. The allocation of church sites will be integrated with detailed planning of the residential precincts.

iv. Health and Welfare Services

A development the size of Mindarie will require a comprehensive range of medical, dental and welfare services which would include infant health centres, general medical practitioners, some specialist health care, domiciliary services such as nursing, occupational and physiotherapy and home help, dental clinics as well as counselling services and social work agencies.

In the early stages of development, the services of a general practitioner will be in most demand. The lack of local health care is a major cause of complaint by persons moving to new

communities. Accordingly, efforts will be made at an early stage in the development program to attract medical practitioners to Mindarie. Ideally, one doctor should be available for every 2,000 residents. On this basis there will be about 40 doctors practising at Mindarie by the time the development is nearing completion. There will also be a need for local dental care at a fairly early stage and dental facilities should be planned on the basis of 1 - 2,500 persons. This ratio will create a demand for some 30 dentists at Mindarie when development is complete. Where group practices operate, the population/facility ratio may be able to be increased.

It is proposed that medical and dental clinics be located both within the Town Centre and at local activity centres. This will ensure that they are easily accessible to the majority of residents. Additional facilities could be available within residential precincts.

It is already apparent, and population projections for the Shire of Wanneroo reinforce this assumption, that a regional hospital facility will be needed within the Shire to serve the outer areas of the North-West Corridor. This hospital should have pediatric and obstetric facilities so that it can meet the likely needs for this type of care within the Shire. An ambulance centre could be established within Mindarie to service the local population.

It is likely that a regional hospital will be established at Lake Joondalup, on Government owned land. This would largely provide for the hospital needs of Mindarie residents.

Apart from the regional hospital which would provide for the primary health care needs of Mindarie residents, there will be a demand for additional hospital care which could be provided by private hospitals and residential facilities for the frail aged. The possibility of including these facilities at Mindarie should be further investigated as development proceeds.

It is desirable that social workers and counselling services be available within Mindarie. Some of these services will be associated with the regional hospital, but they should also be included within the community health facilities at Mindarie.

v. Other Community Facilities

Exhibition Centre

An exhibition centre showing the potentials of the development when complete could be important in attracting people to Mindarie, and could be established as the first part of a community complex. At a later stage the exhibition centre

could be used by the community for social and recreational activities. It should be located in a central position preferably close to, or within the area designated as the major shopping, commercial and social activity region.

Hotels

Efforts should be made to secure permission to establish hotels and taverns, perhaps combined with restaurant facilities, within the different precincts to serve the local population. Residential hotels close to the beach could be feasible in the future and the potential for this type of development should be further investigated. Sites for these facilities should be allocated early in the development to secure optimal locations and prevent later friction.

Youth Centres

Since the population of Mindarie will be predominantly young, efforts need to be made to provide facilities for various youth clubs, sporting associations, etc. to form branches at Mindarie. In new developments major problems are often created because the facilities available are only suitable for young children. As development proceeds facilities for teenagers such as coffee shops, drama workshops, gymnasiums etc. will need to be provided. The demand for these facilities is unlikely to arise in the early phases of development (the first 5-10 years). However future demand should be estimated and evaluated on the basis of early population movements so that programmes can be developed to meet these needs as they arise.

Community Centre/Library

Sites should be set aside within the Town Centre and selected local centres for community halls which can be used by local groups and for libraries. The development of these facilities is unlikely to be warranted in the early phases of growth when it will be more economical for community social needs to be met by the dual use of school buildings. It is recommended that the first library be located near the first high school so that the facilities can be readily shared by students and the adult community.

Theatre, Cinema, Restaurants

It is recommended that a theatre and cinema be incorporated in the Town Centre and that restaurants be encouraged to establish both in the Town Centre and at local centres. These facilities will tend to develop in response to population growth and are unlikely to be established until development is well underway.

8.3 Community Development Associations

Associations of property owners have been operating successfully in the United States since the early 1960s. In Australia, this form of association is relatively new but is likely to gain in importance as local groups become increasingly concerned with local environment. An association of homeowners has been operating fairly successfully at Crestwood Estate, south east of Perth, since its inception.

Purpose

A well run Community Development Association can provide residents with the means to influence the quality of the community in which they are living. It helps to establish the community by bringing people together to work towards establishing local facilities and maintaining common property. This aspect is particularly important in a new area where facilities often tend to lag behind development causing discontent amongst residents.

Benefits

A well run homeowners' association can benefit the homeowners (by involving them in local decisions and providing them with a forum for expressing their ideas on the development and maintenance of their area), the developer (by establishing communication with homeowners which will permit him to identify potential markets and desired facilities) and the Shire by relieving them of some of the burdens of maintenance and supply of community facilities (such as, local play lots, playgrounds, sporting facilities and common areas).

More specifically, a Community Development Association can provide the following benefits to its members:

- it ensures that property values will increase over time by assuring that high maintenance standards are provided for and adhered to
- it creates an easy, egalitarian way for homeowners to share the maintenance costs and benefits of high quality recreation areas
- it keeps homeowners interested and active in the affairs of the community
- it permits the ownership, operation and maintenance of swimming pools, community buildings and recreation facilities to be vested in the community which then becomes responsible for such tasks as policing open areas, deciding on hours and operational practices for pools and community centres, enforcing covenants etc. This can lead to the avoidance of potential conflict between the developer and homeowners.

Method of Establishment

Each community will have different needs so the responsibilities and areas of influence of community associations will vary widely. It is intended that the developers will incorporate the association and underwrite it during the early phases of development until such time as it has sufficient members to reach independent size and status. The various rights and obligations for the developer, community association and individual landowners will be established at this stage. Most associations operate on a non profit, automatic membership basis.

In general, the procedure for establishing an association is as follows:

- the developer legally creates an automatic membership, non profit homes association to maintain and operate the community facilities provided for the community
- title to the common property is placed with the association
- the use of common property is defined and each lot owner is given the legal right to use and enjoy the common property
- the association is given responsibility for operation and maintenance of the common property
- the association and/or development company rates each lot to assure the association sufficient funds and to provide safeguards against undesirably high charges
- each lot owner is assured voting rights in the association. In the early phases of development it is usual for the developer to retain control of the association through weighted voting rights.

American experience has shown that the most successful associations have been those where residents become responsible for community affairs early in the development since many are most receptive to such associations immediately after moving to the area.

A community of the size projected at Mindarie could contain several community development associations as well as a "Master Association" made up of representatives of the local associations. The latter body would be concerned with the administration of facilities provided at the city scale.

It is recommended that the local associations conform with the residential precincts outlined in Interim Development Plan. The arrangement would provide a logical basis for the provision and administration of facilities.

The particular form and responsibility of the various associations should be determined in consultation with prospective members and in relation to its proposed functions.

9 Recreation Planning and Open Space Provisions

9. RECREATION PLANNING AND OPEN SPACE PROVISIONS

In the planning of residential developments of the scale of Mindarie, the recreation requirements are closely related to the needs for open space.

A positive and comprehensive approach to leisure planning based essentially on local requirements is recommended. Public demands for recreation facilities have been growing as a result of increased leisure time and there has been a response from all levels of government to the need for more imaginative leisure planning than the traditional provision of dispersed parks and playing fields.

There has been a movement away from competitive leisure activities (beyond the early teen years where this form of activity remains popular) towards a broader spectrum of recreational pursuits which include non-competitive indoor sporting activities (gymnastics, squash, billiards) and arts and crafts which require work shops and meeting rooms. These trends will be further explored and the findings adapted to the planning of facilities at Mindarie.

While it is difficult to forecast the effects of providing different recreation facilities and the likely direction of future demands, it is possible to establish broad standards and desirable locations which are adaptable and most likely to meet the diverse demands of residents in the area.

As development proceeds and the community grows, it is desirable that interested persons be given the opportunity to become involved in recreation planning, in some cases through the medium of a Community Development Association as discussed previously.

9.1 Goals for Recreation and Leisure Planning

Every effort will be made at Mindarie to ensure that the local population is provided with recreation opportunities from an early stage of development.

The following general goals have been established as a basis for recreation planning.

- to make provision for a variety of active and passive recreational facilities at Mindarie which will enable residents to select the form of activity which best suits their needs.

- to ensure that the facilities provided respond to local demands and that they are phased to coincide with population growth. This will require a degree of flexibility so that land which has been allocated to these uses can be adapted to meet the preferences expressed by local residents.
- to ensure that access to major recreation areas is adequate and that proper provision is made for parking. A pathway network linking residential precincts with community and sports areas is desirable.
- to make sporting and recreation facilities as attractive as possible.
- to promote economical use of facilities by planning for dual use of educational and other institutional and sporting facilities, concentrating facilities in a central location and encouraging the development of multi purpose buildings which cater for a variety of age groups and interests. Fig. 18 demonstrates this concept.
- to create an effective management and administrative structure for community recreation facilities and to ensure that local residents are aware of the facilities available and involved in their management and maintenance. Early employment of community recreation officers could also be of benefit in this respect.

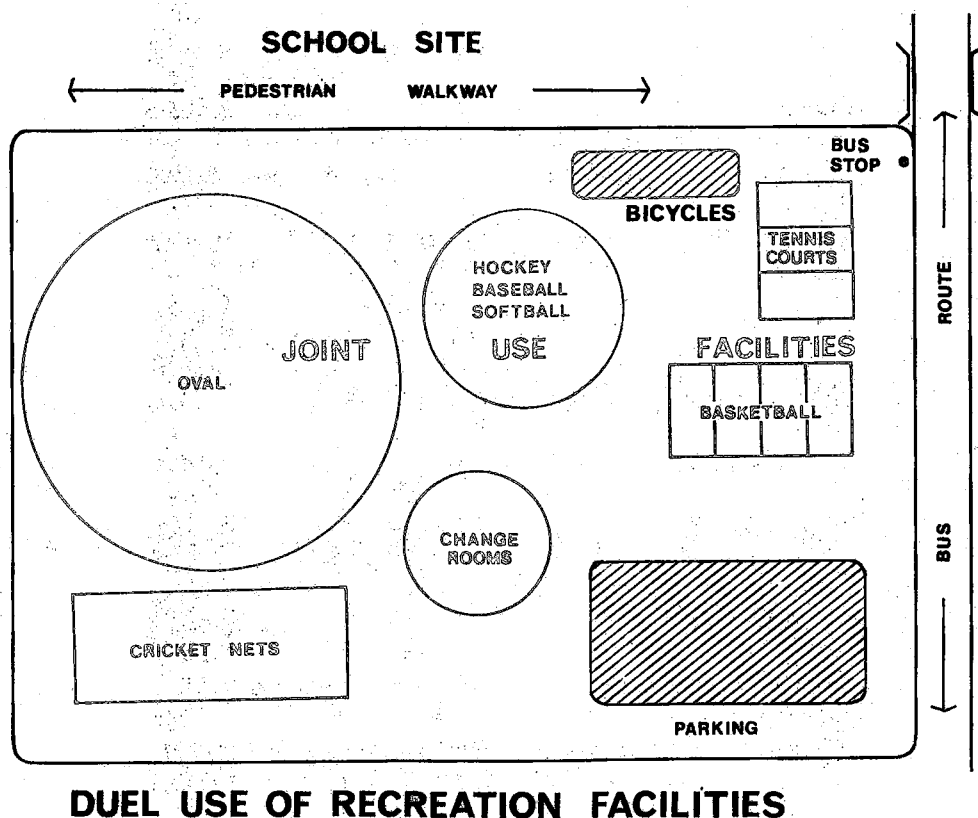


Fig.18

9.2. Recreation Potentials at Mindarie

i. Leisure Needs

The planning of recreation facilities will be based on the needs of the four main groups expected to live at Mindarie, viz, children, teenagers, families and elderly persons. While some of the leisure needs of these groups will overlap, there are sufficient differences for each to be treated separately.

Children:

It is anticipated that there will be a large number of pre-school age children at Mindarie throughout its development since each new subdivision is likely to attract young families seeking their first house. They will require to play close to their homes where they can be readily supervised.

Older children can play further from home. Their activities may require larger areas and could be incorporated in neighbourhood parks or on open space associated with primary schools. They are able to make their way independently and could make use of pedestrian networks or bikeways. Some age groups will tend to join scout or club groups which should be catered for at community centres or local sportsgrounds.

Teenagers:

Adolescents often need to come together with minimal supervision in an informal atmosphere. Planned communities have tended to ignore their needs resulting in discontent and alienation of the group and creating friction in the community.*

Planning for teenage recreation should ensure that major facilities are centrally located, possibly close to, or within regional and local centres. The need is for informality and self-management and the availability of good youth leaders with whom the group can identify will play a vital role in sustaining interest in activities.

Access to sporting facilities such as gymnasiums, swimming pools and ovals is also important for this group who tend to be active participants. Information about opportunities to join in activities should be readily available.

Families:

To some extent family recreation needs will be met by home based activities, particularly in the early stages when the desire to establish the house and garden leads to leisure time being spent at home. However, there is

* See H.J. Gans "The Levittowners"
The Penguin Press London, 1967 P.207

also a need for interaction between families and between individual members of the family.

Some of these needs will be fulfilled naturally as the community grows and leaders emerge in different spheres of activity. Often, people who have been active in particular areas in their previous neighbourhood (perhaps in charitable organisations, sporting clubs or cultural and social activities) will seek to establish similar groups in their new environment. Similarly, church groups will often develop social or educational programs soon after establishing in a new area.

Opportunities for informal family recreation will also be important. The local beaches and surrounding park-lands will provide ideal conditions for fulfilling these needs.

Elderly Persons:

This group will mainly require passive recreation opportunities and their needs will differ from those discussed so far. The provision of seating areas within parks and shopping centres will be important to them and will provide them with opportunities for informal social interaction. It is important that elderly persons are not isolated from the community and in planning for their recreation needs it is essential to ensure that they have access to public transport and to shopping and eating facilities.

Some opportunities to follow active recreation pursuits will also be required including bowling, golf and social clubs. The Community Development Association in conjunction with potential club members could be instrumental in establishing facilities for active recreation.

ii. Facilities

The early establishment of recreation facilities tends to act as a catalyst both to the sale of land and housing and to the formation of a "community" in a developing suburban area. It is desirable for the facilities to be organised and operated by local committees working closely with the Local Authority and for the facilities to relate to the needs of the residents as described above.

It is suggested that the following recreation facilities be developed at Mindarie:

Small Play Areas:

Small, safe play areas should be incorporated in each residential area, preferably within sight of homes and away from major roads. Some could be included with playgrounds and neighbourhood parks. Equipment specially designed for pre-school age children, grassed areas and sandpits should be included in these areas.

Playgrounds:

These should be designed to cater for older children living within about a 0.5 kilometer radius and could be sited in larger parks. It is generally preferable to have several smaller, well located playgrounds which relate to residential areas so that all children in the areas can use them, than one major parkland area.

It is suggested that some playgrounds be associated with primary schools to ensure maximum use of facilities at all times.

The facilities provided should be sufficiently varied to cater for children of various ages ranging from primary school age to early secondary school groups. A small hall for guides, scouts, arts and craft activities etc, could be incorporated in one area of the playground, allowing these groups to utilise the outdoor areas.

Parks:

The areas to be reserved for parks are located on Fig. 19. They relate to the areas identified in the environmental study. These parks would generally be about 4-6 hectares in extent, although some would be larger and would provide mostly for passive recreation with lawn, trees, pathways and benches. Several of these areas have been tentatively combined with school sites on the Interim Development Plan to provide maximum use of facilities.

Some of the more attractive parklands will be able to be left in their natural state but where landscaping is necessary, it should be carried out at the time of development.

Sports Areas:

There is a need for areas to be reserved for sporting activities in central locations. These should be relatively flat and could contain ovals, tennis courts and basketball courts. Indoor sports centres could be constructed as population growth and demand warrant. A local sporting complex could include the following facilities:

- Swimming pool - although Mindarie is on the coast the provision of swimming pools particularly heated indoor pools which can be used winter and summer, would be an asset to the development. If located close to a primary or high school, full use will be assured. Experience in other development areas indicates that the inclusion of a public pool attracts people.
- Ovals - are used mostly by younger age groups. Areas suited to football, rugby, soccer, athletics, hockey, baseball, cricket, etc, could be incorporated. Some amount of travelling between ovals is inevitable so they should be located in areas where road access is good.
- Tennis Courts - the provision of six courts requires a site of 5,000 square meters. It may be of benefit to concentrate court facilities in an area convenient to 2 or 3 residential areas to encourage the formation of a club which can be used both by school children and adult members of the surrounding communities.
- Squash Courts - these are a popular recreation facility which do not take a great deal of space and are able to be incorporated within a sports centre or built separately and operated as a commercial venture.

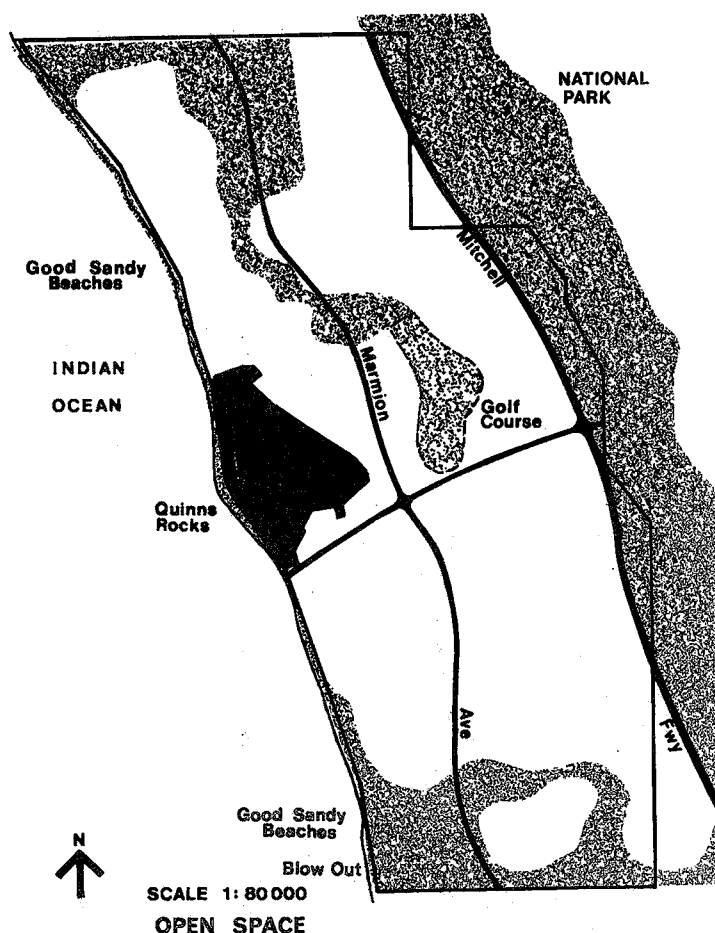


Fig. 19

Community Recreation Centre:

This could be associated with a sporting complex and be developed in stages in accordance with population growth and the expressed demands of the community. A large centre providing a range of indoor and outdoor activities including workshops and meeting rooms, auditorium, reading rooms, child care facilities, gymnasium, swimming pool, squash courts, athletic and playing fields and tennis courts, viewing areas, restaurant, snack bar, change rooms etc, requires a large catchment population and would not be warranted until development is well advanced. Since this type of facility would be desirable in the long term and could provide a focal point in the community, it is recommended that land be set aside in a central location close to the Town Centre for this purpose.

Its development could be partially financed by the residents and partly by government and Local Authority grants under the Community Recreation Council Assistance Schemes.

In addition to the open space and recreational facilities provided within each precinct, there will be areas of regional open space which will cater for both the local and regional population. These will include the beaches, regional parklands and the proposed golf course.

9.3 Planning for Open Space

The main areas of regional open space close to Mindarie are shown on Fig. 20 and include:

Yanchep National Park:

This area which is largely in its natural state is located to the north of Mindarie. It contains a lake, flora and fauna reserves, caves and picnic sites and has long been a popular recreation area attracting visitors from the entire Perth Region.

Neerabup National Park:

This adjoins the eastern boundary of Mindarie. It is a scenic area which is to be preserved as natural bushland.

Lake Joondalup Recreation Area:

The Metropolitan Region Planning Authority has proposed the development of a major recreational area on 1620 hectares of land surrounding Lake Joondalup and Lake Goolelal, southeast of Mindarie. Both active and passive recreation will be catered for in this new park with emphasis on entertainment facilities. A substantial proportion will be retained as natural bushland, and a wildlife sanctuary is to be provided on Lake Joondalup. It is envisaged that the area will incorporate an olympic rowing course, yachting facilities, boat clubs, a golf course, ornamental

gardens, restaurants and picnic areas, a showground/fun fair, theatre, university and hospital.

If these proposals are formally adopted and the land reserved for these purposes, the northwest sector will be more than adequately served with regional open space and weekend recreation facilities. However, access from Perth will need to be improved if the full potential of this area is to be realised.

A major recreation facility of this nature will enhance the development potentials of Mindarie and will reduce the need to provide passive open space within the development.

Beaches:

The coastline stretching from Perth to Yanchep and beyond, provides a natural recreational resource with its wide sandy beaches and bathing areas. Its existence is a major incentive for development in the area.

Marina:

The Yanchep Marina and the proposed development of another marina at Ocean Reef will provide recreation opportunities for boating enthusiasts living in the northwest corridor. The feasibility of constructing a marina at Mindarie will be investigated.

REGIONAL RECREATION FACILITIES

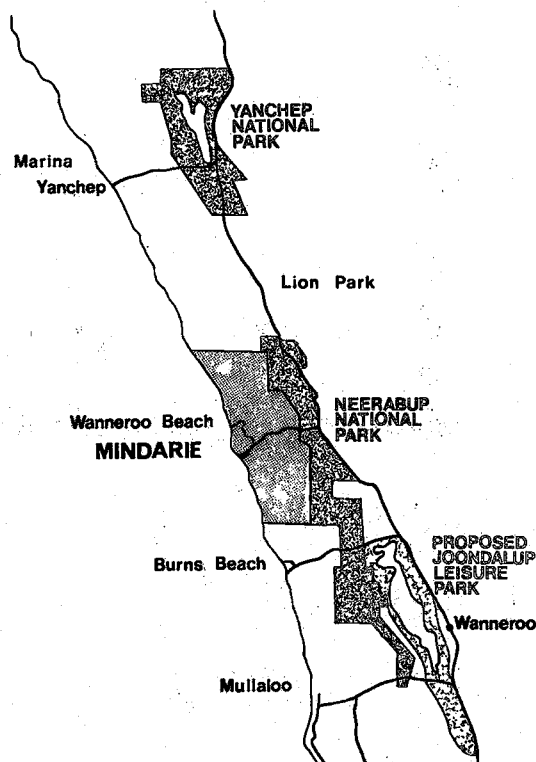


Fig. 20

9.4 . Open Space at Mindarie

The provision of open space at Mindarie will be related to the physical form of the land and the recreation needs of its residents.

The areas most suited to conservation and recreation have already been established in accordance with the concept of "intrinsic suitability" devised in the Stage I studies.* These areas provide the basis for the definition of specific areas of open space which will be related to recreation needs.

Three categories of open space have been defined.

Land left in its Natural State:

This will include national parks, identified conservation areas, beaches and unique scenic features.

Landscaped Areas:

Small parks, walkways and bikeways and buffer zones separating urban precincts comprise this group. These areas are spread throughout the development and have been based on the suitability of the land to these uses and the layout of the areas in which they occur. Space for childrens' play will be included in this group. The major areas are shown on the Interim Development Plan.

Space for Organised Sports and Recreation:

These will be incorporated in each area of subdivision when detailed designs are underway. Major facilities will be included within the areas of open space already defined.

Quantitative Standards:

The Town Planning Board requires that 10 percent of the development area be allocated to open space. While this figure provides a rough guide to overall requirements, it is important to relate areas provided as open space to the form of development and the population served.

* "Mindarie Environmental City"
USC June 1973. Refer Figs 3A and 3B.

Standards applied in development areas in New South Wales * are based on a requirement of 3 hectares of open space per 1000 population. On the basis of these standards an environmental area containing 7,000 persons should contain approximately 0.5 hectares for playlots, 4 hectares for playgrounds, 1.5 to 3 hectares for pedestrian pathways, 5.5 hectares for neighbourhood park, 5.5 hectares for sportsgrounds with other uses including a pool, squash courts, tennis courts etc, utilising 2.5 hectares. Regional open space is additional and is not included in these calculations. It is suggested that this approach to the planning of open space be investigated at Mindarie since it is better suited to relating open space allocation to community needs than a flat percentage figure for the whole development.

* Sherwood Hills - Open Space Policy USC 1971

10 Public Utilities

10. PUBLIC UTILITIES

This chapter outlines the requirements of the major public utilities to serve the future urban population and development at Mindarie. Particular attention is given to the environmental constraints, engineering requirements and standards, and the various facets of public utility design. The study examines the existing situation, the estimated load capacity of present services and alternative methods of meeting future demands.

10.1 Water Supply

Supply Authority

At present the Country Water Supply Branch of the Public Works Department controls water supply to Quinns Rocks, although it is endeavouring to transfer authority to the Metropolitan Water Supply, Sewerage and Drainage Board (MWB). When the transfer is completed it will be possible to obtain definitive statements outlining future development policy and management for the area.

Present Demand and Supply

The estimated demand of 410,000 litres of water per day at the existing settlement is met by bores drawing from the shallow, unconfined aquifer. The domestic supply is from two production bores near to the settlement. The Mindarie farm is served by a number of wells throughout the property. After standard treatment to remove impurities, the unconfined aquifer can supply good potable water, in excess of 4,500 litres per household per day. The aquifers are recharged by local drainage into the soil but are unlikely to provide a permanent service of water for the whole of the anticipated development.

Future Demand

An estimate of the possible increase in demand for water, based on an assumed consumption rate of 614 litres per head per day, and the projected population growth, is shown below.

PROJECTED WATER DEMAND OF
MINDARIE ENVIRONMENTAL CITY

PROJECTED POPULATION		ESTIMATED WATER DEMAND*
		(million litres per day)
1981	5,000	3.07
1986	13,500	8.29
1991	32,000	19.65
1996	52,000	31.93
2001	72,500	44.21

* Assuming a daily per capita water consumption rate of 614 litres

This represents the likely increase in demand before the end of the century although it is possible that the consumption rate may rise to a higher level. Demand averages also include commercial and industrial uses, although special industrial demands, such as major production works, have not been included.

Future Supply

It is anticipated that it will be possible to adequately satisfy the estimated demand from two alternative resources. Fig. 21 shows these sources in relation to Mindarie.

i. Gnangara Mound

The MWB has established the existence of extensive resources of ground water in the Gnangara Mound, east of Wanneroo Road, north of Mirrabooka. Preliminary investigations show that the most accessible bulk of water lies in an unconfined aquifer close to the surface. It extends over an area of approximately 530 square kilometres, which at present is largely a forestry and rural reserve. It is intended that this area which is between the northern and eastern corridors, remains largely undeveloped. This will ensure long term protection and preservation of the underlying water from possible runoff contamination.

The water could be obtained in large quantities from shallow bores and would be of potable quality after treatment for the removal of gases, iron, turbidity and colour.

WATER SUPPLY AND SEWERAGE SYSTEM MINDARIE ENVIRONMENTAL CITY

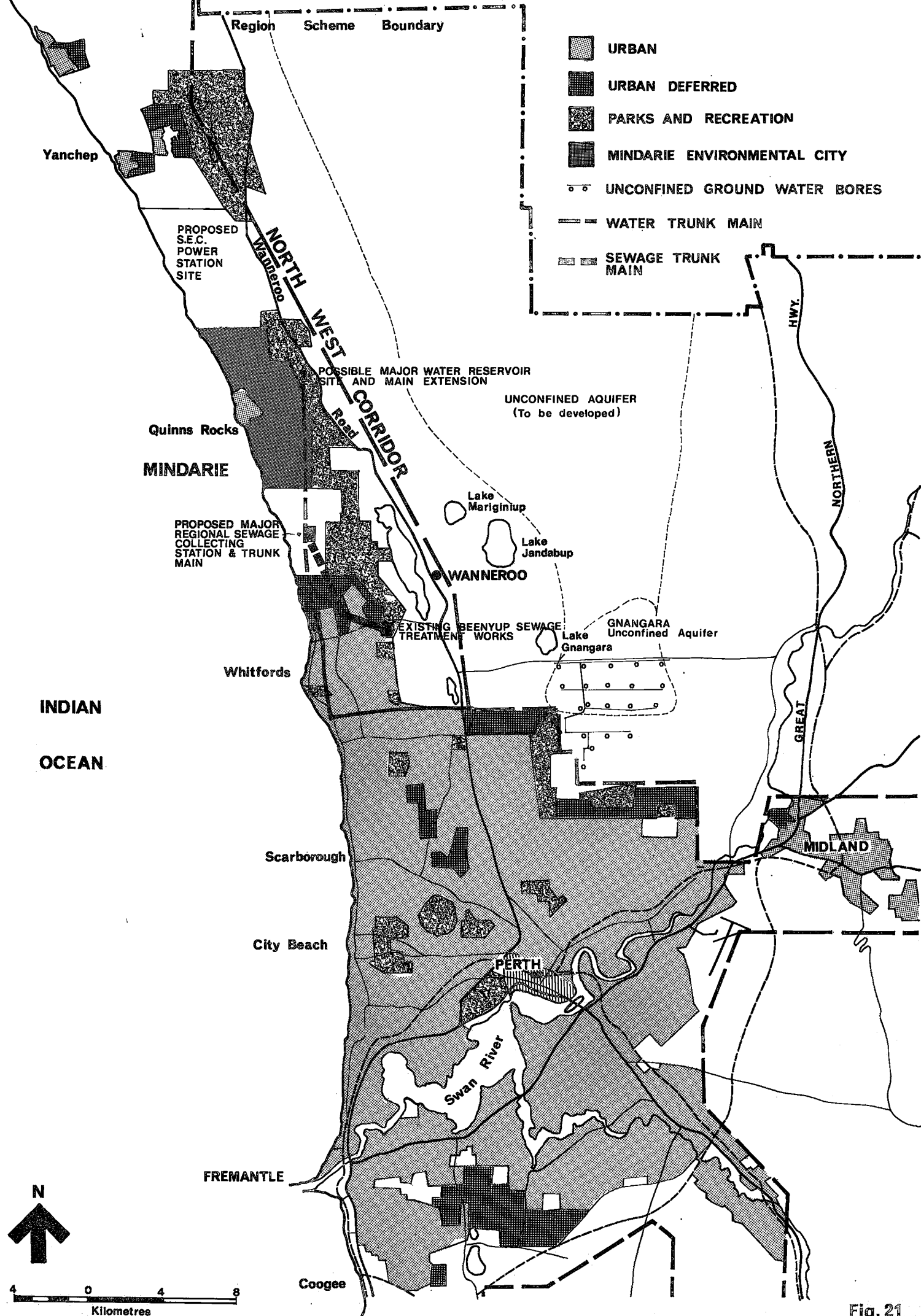


Fig. 21

Gnangara Mound is approximately 16 kilometres from the coast at Quinns Rocks. Supplies to Mindarie by the development of Gnangara Mound would be in accordance with the present expansion of the MWB's water supply network. However, the cost of constructing water mains and headworks through undeveloped areas to Mindarie would be high and may depend on development occurring between Mindarie and Gnangara before or simultaneously with development at Mindarie. Under these circumstances it could be several years before water from Gnangara is distributed to Mindarie by the MWB. It is suggested that negotiations between the MWB and interested developers with reference to funding of headworks be undertaken to hasten the process.

ii. Local Aquifers

Water for the early stages of development at Mindarie could be obtained from deep underground aquifers at a rate of more than 4,500 litres per house per day and it is likely that the same source can be used for the whole development. It will be necessary to sink trial bores to ascertain the quantity of ground water which can be safely drawn from this aquifer without adversely affecting the environment and its quality and the optimum spacing of bores.

Bores to the confined aquifers, which lie 200-300 metres beneath impermeable layers of silt, clay and shale, will be more expensive than those to the shallow aquifer, but there is virtually no danger of pollution from percolation. The water will contain quantities of iron and it will be slightly harder than surface water, but by relatively simple treatment it can be converted into acceptable drinking water. Each bore to the lower aquifer will probably prove capable of supplying sufficient water to meet the demands of 400 to 700 households.

Some water could be obtained from the unconfined aquifer but the quantity which can be safely extracted without disrupting the existing ground water levels, vegetation, trees or farming operations, would be insufficient to satisfy the expected demand for an indefinite period. It is suggested that these water resources be used for irrigation of open space areas, such as the proposed golf course and parklands.

Even if Gnangara Mound is eventually exploited to serve the northwest corridor, it will be necessary to obtain water for the early stages of development at Mindarie Environmental City from the deep unconfined aquifers. In the long term the cost of the bores and the treatment plant will need to be written off. In relation to overall costs, the loss would be in the order of 15 to 20 percent although nearly all of the reservoirs, mains and reticulation will continue to be used for the irrigation of open space.

Treatment Works

Water from both the shallow unconfined and deep confined aquifers will require treatment to produce potable water. The usual treatment processes employed are spray aeration to remove chemical impurities and colour, clarification, filtration, and the miscellaneous addition of chemicals to protect against bacteriological contamination.

A Water Treatment Works, which will accommodate these processes, will need to be centrally located to the expected development, possibly in the vicinity of Quinns Rocks Road. Any noxious by-product wastes or odours will be disposed of so that the impact on the environment is kept to a minimum.

Collection and Distribution

A distributing reservoir system is proposed for Mindarie. Water will be pumped to a major reservoir whose elevation enables gravity flow to service reservoirs, which in turn control the reticulation through mains to individual households.

The major reservoir will need to be located on high land. If the local underground source is used water will be pumped, via the treatment works, to this main storage, whereas if water is from the Gnangara Mound, it will be supplied directly to the reservoir from the large trunk mains.

From the main reservoir water will flow or be pumped to service reservoirs which control the daily variations of supply to consumers. Some of these will be elevated storage tanks which assure a uniform water pressure and supplies of water to the high level areas.

The distribution system, which carries water from the reservoirs to users, consists of a network of underground pipes, generally following the street network. The principal mains of the major distribution network should form a series of loops, or closed circuits, to maintain pressure and continuity of supply.

10.2 Sewage Disposal

Present Situation

The Wanneroo Shire Council Health Department is currently responsible for sewage disposal at the existing Quinns Rocks settlement. They supervise the installation and maintenance of septic tanks in accordance with State-wide regulations. The sandy soil conditions allow a high absorption capacity and with the limited number of septic tanks, ecological or service problems are minimal.

However, the use of septic tanks on a large scale could eventually result in pollution of the shallow ground water system and is considered unsuitable for Mindarie.

Future Reticulation and Mains Installation

Fig. 22 shows the main sewerage catchment areas and pump stations at Mindarie. Sewage will be collected from individual buildings by a network of sewers, including house connection, street sewers, trunk sewers and finally the main sewer. It will be collected by gravity flow in each of the separate catchments, draining into a series of pump stations. The size of each type of sewer will depend on the anticipated load it must carry.

In rocky, limestone areas or in very broken ground, consideration should be given to the possibility of collecting sewage by a vacuum system. A problem with this system lies in the difficulty of providing sites for the individual vacuum stations and in the possible necessity to separate sullage from sewage.

From the pump stations, sewage will be conveyed through a series of rising mains or gravity mains to a sewerage treatment works. The location and capacity of the main sewers and the treatment plant are critical, since these represent the upper limits placed upon the density and rate of development.

Sewage Treatment Works

The sewage will be treated to remove solids, destroy pathogenic organisms and to oxidise offensive compounds. The usual method for treating the sewage is the extended aeration activated sludge process. The process depends on the almost complete stabilisation of incoming sewage by biological oxidation.

The final choice as to the location of the works depends on future government policy, but the two alternative possibilities are the Beenyup Sewage Treatment Plant, controlled and served by the MWB in the Whitford area, and a plant constructed at Mindarie.

i. Beenyup Treatment Works

A major regional collecting station is proposed in the area immediately south of Mindarie. This would collect sewage from the pumping stations scattered over large areas to the north and pump it to a MWB gravity sewer. It would then be conveyed to the Beenyup Treatment Works. The plant is designed to serve an eventual population of 600,000 by operating 16 aeration tanks.

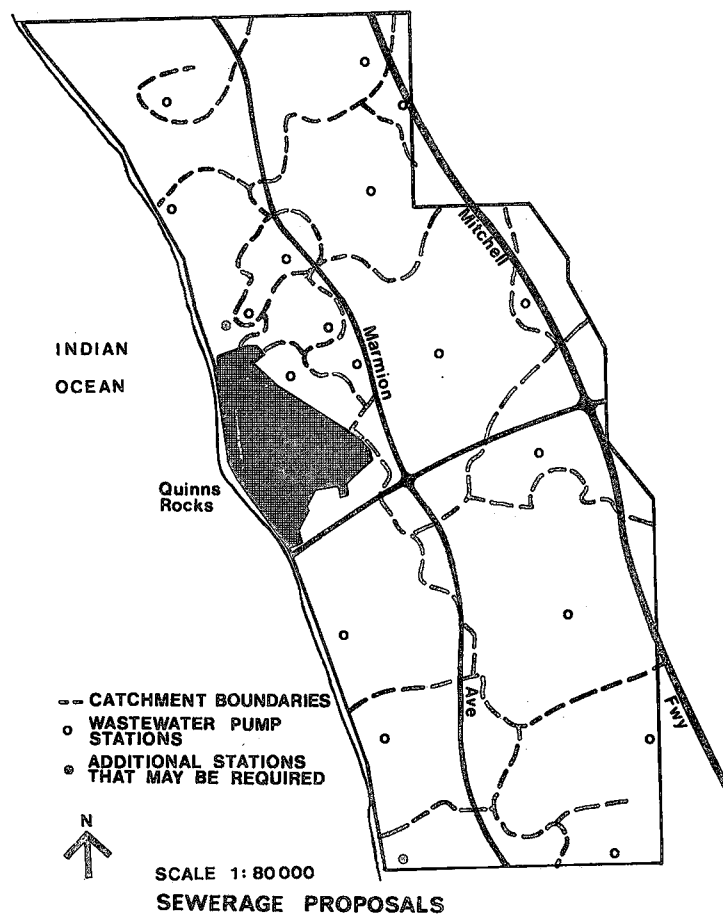


Fig. 22

The detailed design and construction of the major regional collecting station and the expansion of the treatment works at Beenyup is several years away. Initial development at Mindarie will require a temporary treatment plant until the intervening land is developed and the population between Beenyup and Mindarie has increased sufficiently to warrant the construction costs of the necessary head-works.

ii. Local Treatment Works

The primary stages of development at Mindarie will require an extended aeration plant which will refine effluent to an acceptable standard for discharge into the soil by irrigation sprinklers. Extensions to the capacity of the works would have to be completed as the population increased until the volume of sewage made the construction of the first stage of a permanent treatment works economically feasible. At this point the MWB would be likely to assume responsibility as the plant capacity would gradually serve developed areas beyond Mindarie.

The possible location of a treatment plant at Mindarie will be subject to considerable investigation and negotiation. Although the aeration process creates no nuisance from noxious odours, the plant should be shielded by land-forms and/or very thick vegetation.

Waste Water Disposal

In the primary stages the treatment plants will pump the effluent to an isolated sandy site for disposal by spray irrigation. The reclaimed water will be odourless and only slightly coloured. In Mindarie it could be used to irrigate the large sand blow-out to the south which will help to stabilise the dunes and permit regrowth.

Ultimate disposal of effluent will be to the ocean from a coastal launching site. The MWB have already acquired a site for this purpose close to Beenyup. At Mindarie the site would have to be isolated and away from the major swimming beaches, preferably in the vicinity of strong seaward tidal currents.

10.3 Drainage

Present Situation

The permeable sandy soils which underly the existing Quinns Rocks settlement allow rapid percolation of rainfall to the shallow unconfined aquifer, with no danger from flooding. The Wanneroo Shire Council issue a standard

drainage specification for subdivisional stormwater drainage design and disposal of stormwater is by means of soakage in stormwater sumps. The practice of using open absorption basins has been discontinued and the standard type of fenced sump is now required.

Future Requirements

In the near future, the MWB is likely to control drainage requirements and although there is no natural surface drainage, the sandy soil encountered throughout the greater part of Mindarie will present few drainage problems.

The basic drainage pattern is for water runoff from houses, paths and roads to collect in stormwater drains and then be returned to the soil through sumps and soak pits. Recent developments suggest that it may be possible to provide a satisfactory road pavement at Mindarie which will permit water to percolate straight through into the subgrade. If tests prove that this proposal is feasible the extent of drainage and kerbing can be reduced and some sumps may be dispensed with.

Those areas where sumps will be necessary could be turned into ornamental lakes surrounded by an open space system. The lakes could be designed to blend in with the requirements of a surrounding parkland.

In areas where the limestone lies close to the surface, there may be difficulties with disposal of stormwater through sumps and consideration will need to be given to direct disposal of stormwater into limestone cavities.

The water from the sumps will eventually percolate into the shallow unconfined aquifer. The same water could then be recovered for irrigation of parks and golf courses or for ornamental purposes, such as fountains.

10.4 Electricity Supplies

Present Situation

The State Electricity Commission provide a single 22 Kv line along Quinns Rocks Road to serve the small settlement on the coast. This 22 Kv is reduced by a 'step down' transformer to a voltage suitable for use in homes. Overhead service mains connect the street mains from the transformer to the houses. It is expected that any future development at Mindarie could be served by extensions to the existing electricity supplies.

Future Requirements

An estimate of future demand for electricity at Mindarie is difficult to predict at this stage. The possible establishment of industry and the unpredictable degree of consumer acceptance of electrical appliances such as air conditioners, make demand projections unreliable.

The State Electricity Commission has indicated that it will be able to satisfy likely demands. Eventually a regional zone sub-station will be required to provide a more efficient supply for future development. This station will receive very high voltages which will be stepped down to 22 Kv or 11 Kv. It will control the supply of electricity from the main transmission system to the sub-distribution system. Two hectares of land will be required to site the sub-station, which should be centrally located. It is recommended that the surrounding area be landscaped to ensure the integration of the sub-station with the surrounding environment.

Underground Reticulation

It is recommended that the benefits and costs of underground reticulation at Mindarie be investigated. Underground power distribution produces a more attractive community, greater public safety, less maintenance and more dependable service than overhead reticulation. Forward planning should locate the underground network such that its extension, alteration or eventual renewal is completed in an organised and non-disruptive manner.

The State Electricity Commission recognises the beneficial aspects of underground reticulation. Technical developments allow underground wiring for lines up to 22 Kv. These technical advancements have reduced the installation cost to about \$280 net per lot (at current prices) in new subdivisions, which also includes the supply of street lighting. The cost may be increased slightly for lots developed in limestone areas.

Future Industrial Demands

A new power station site is being considered at Alkimos to the north of Mindarie Environmental City. It will serve the increased industrial development in the north west corridor and will also be connected to the SEC grid system. The power station is not programmed to begin operation during the next few years but dramatic earlier changes in the demand for electricity could influence the time factor.

10.5 Refuse Disposal

Present Organisation

The Wanneroo Shire is the municipal body responsible for refuse disposal at Mindarie. Garbage is collected from each household at Quinns Rocks and deposited in an open dump some 20 kilometres away. As the population of the Wanneroo Shire grows, the disposal of garbage will be of major concern. Future planning must examine the feasibility of new techniques of refuse disposal and their applicability at Mindarie.

Future Alternatives

i. Open Dumping

This is the current method for garbage disposal. It is the least satisfactory in that garbage is exposed to the air and a breeding ground for rodents and flies. It is considered an unacceptable method of refuse disposal at Mindarie.

ii. Incineration

A central incineration operation can substantially reduce the volume of rubbish. The resulting residue is inert and can be used for landfill. The main problems are from air pollution and from chemical by-products as a result of the combustion. Experience has shown that dangerous and noxious compounds can be formed by mixing various items of garbage in a combustible situation and that these can seriously damage the incineration equipment. It is therefore extremely unlikely that the Wanneroo Shire will adopt this method.

iii. Pulverisation

This is the most acceptable alternative because it overcomes the basic problem of space allocation by drastically reducing the final volume of disposal refuse. The pulverisation process is one where garbage is collected and deposited in a central collection depot. The rubbish is then pulverised into finer particles. This process results in a much reduced bulk volume of garbage which can be used successfully for land fill purposes and does not create a nuisance from air or water pollution by-products. It also provides economic opportunities to create improved sites and to shape the landscape. Detailed investigation of this method should be undertaken and, subject to the findings, land should be reserved in the more remote areas of Mindarie for refuse disposal.

10.6 Telecommunications

The Postmaster General's Department, through the Neerabup Exchange, provides telephone services to Quinns Rocks. The Neerabup telephone exchange/trunk line equipment can be satisfactorily expanded at a rate commensurate with the growth of new telephone subscribers at Mindarie. The telephone reticulation will be underground and set apart from the underground power reticulation for technical reasons.

10.7 Location Criteria

The location of all utilities will be considered together during the detailed design of each sub-division.

The various public utility structures such as treatment works and the zone sub-station will, as far as possible, be located together. This will localise their visual impact on the City and economise the landscaping and tree planting programmes that will accompany their construction. Those utilities that will have a visual prominence, such as water towers, will need to have an aesthetic design that is consistent with the surrounding area.

11 Interim Development Plan

11. THE INTERIM DEVELOPMENT PLAN

A high quality physical environment will be as important to the well-being of Mindarie residents as will be a satisfactory social life.

The Interim Development Plan is not a definitive proposal for all development over a 25 year programme. Rather, it is a framework for detailed planning over an initial 5 to 10 year period and an outline for future development. The plan is presented as a fold-out attached to this report.

So far in this report the major development functions have been considered separately. This chapter is concerned with integration and the physical expression of concepts.

11.1 Movement

The main physical component giving structure and form to the development will be the road network. Of necessity the major routes will be fixed at an early stage and the plan proposes routes for the primary and secondary road system. Minor roads will be planned in detail as development occurs.

The nature of the road network derives from the corridor structure and from goals for accessibility. It is predominantly a ground-level system and within the constraints outlined, aims for maximum freedom of location and intensity of land use while offering alternate routes for the majority of trips.

Roads are located with regard to engineering considerations - gradient, curvature and cost - as well as the needs for suitably sized traffic-free landuse areas. In addition, aesthetic and environmental criteria have been used. A description of the route location process for the primary network may be found in the initial Mindarie report. It remains valid, although locations of some routes have been altered.

Primary Network:

During the initial stages of development, it is anticipated that the extension of Marmion Avenue will provide major access to Mindarie, replacing the present access via Quinns Rocks Road. At some future date the construction of Mitchell Freeway will provide rapid access, via a major east-west link, between Mindarie and points to the north or south. Together these three routes form the basic movement pattern, and all are designed in accordance with Main Roads Department criteria. These criteria are outlined in Appendix II.

Our preliminary location of Mitchell Freeway (formerly "Stephenson Freeway") as shown in the Structure Plan has been altered. Its new location along the boundary of the property will avoid the severance of Mindarie while providing a physical barrier between urban development and Neerabup National Park. This location has many advantages for the planning of environmental areas within Mindarie and allows limited access across the route, but the problem of residential land adjoining the freeway still exists. Ideally, planning for the northern corridor should locate the freeway completely outside the boundary of urban development.

Secondary Network:

The network of secondary roads forms the basis of "environmental areas" and allows public transport movement in accordance with Metropolitan Transport Trust criteria. Routes are designed to ensure bus access within 0.5 kilometers of all residential development. The pattern also allows reasonably direct access between all areas of Mindarie and encourages longer journeys to gravitate onto the primary network.

Minor Roads:

In general, environmental areas will be free from routes which encourage through-traffic. Because of this, and because of their necessarily limited length, traffic volumes will not be high. Statutory requirements for minimum road and pavement widths should be varied, in accordance with detailed plans for each area, where traffic demands are low.

Other Movement:

Routes for pedestrian and bicycle movement will be provided to link residential areas with centres of activity. These routes will take advantage of local topography, open space and the tertiary road pattern; where necessary, they will be grade-separated at major routes.

11.2 Open Space

Major open space provision in the Interim Development Plan is in accordance with the initial Mindarie Environmental City report. Mindarie will be surrounded by open space - by the National Park to the east and by the ocean

dunes to the west, as well as by open space links kept free from development to the north and south.

An Open Space System:

Major spaces identified in Mindarie are linked together, where appropriate, forming sections of the movement system and allowing continuous passage through natural areas.

Development densities at Mindarie will be such that a high proportion of open space is evident, much of it in private ownership, forming residential lots. In addition, road reserves at all levels will be relatively wide and will be important in the visual impact of the development. To achieve the environmental goals established for Mindarie all these interconnected spaces, conceived of as a system, must be regarded in conjunction with each other and all elements will require attention to landscaping and aesthetic appearance.

The open space system will contain areas whose degree of utilisation will vary from active areas, such as golf courses or sports grounds, to passive parkland. Where appropriate, school sites have been located in open space areas and sites for possible major sporting facilities could be located in the northern or in the southern open space link.

11.3 The Town Centre

Mindarie will be served by a centre comprising 79 hectares, located centrally to the development at the intersection of the primary roads. The location is sufficiently far from other proposed centres on Marmion Avenue for viable commercial development to establish, although its ultimate size will depend on other developments within the corridor.

The Town Centre will provide the main comparison goods and general centre for Mindarie residents and will attract retail expenditures from adjacent areas. It will be much more than a commercial centre, providing for a range of community facilities and tertiary employment. The centre will contain sites for commercial and professional offices, halls and activity centres, public houses, cinema, theatre, places for formal and informal assembly, and sites for ancilliary services, such as fire, police, ambulance and post office.

The Centre will also provide the major interchange between regional and local public transport systems. Subsidiary uses such as new or used car salesrooms, large hardware establishments or discount houses may also locate there,

as may a secondary or special education unit. The centre could also provide space for community development organisations, a major sporting facility and a proportion of higher density residential units.

Over a 25 year development period unused land within the Centre should not remain idle, and could be put to some interim use. On the other hand, the growth requirements of a dynamic Town Centre may eventually demand land in excess of present predictions. An area of 24 hectares has been allowed east of the Centre for possible further expansion, either of the Centre itself, or of the adjacent industrial or residential areas as may be appropriate.

11.4 Environmental Areas

Areas traversed by neither primary nor secondary routes are designated "environmental areas".* They derive from topographic and movement criteria, and where appropriate reflect the landscape and environmental criteria of the initial Structure Plan "precincts."

Consequently, they vary in size, character and potential population. They do not form the basis of definitive "community" or "neighbourhood" areas and may contain several areas of different physical or social characteristics.

Most environmental areas are large enough to require more than one primary school and often more than one commercial site. These facilities will be linked by bikeway and pedestrian systems.

Low traffic volumes within areas will ensure high standards of noise and pollution control. Attention will be paid to landscaping and underground provision of services where appropriate. General net residential densities at Mindarie are expected to be of the order of 31 persons per hectare.

11.5 Education

Seventeen primary school and five combined primary/secondary school sites have been allocated in Mindarie, 3.44 hectares for each single and 12.1 hectares for each combined unit, a total of 119 hectares. Schools are located within environmental areas, often in conjunction with the open space system and within walking distance of most homes.

Schools are also located in relation to bus routes and are often at local centres where the opportunity for shared community facilities is greatest. In addition,

* In the case of Mindarie, the term is generally synonymous with residential use.

a higher education or special school site may be appropriate in the Town Centre.

11.6 Employment Centre

Approximately 80 hectares (200 acres) of land has been nominated as an employment centre, at this stage foreseen as being in the form of an industrial park. It is located on land of low residential attraction adjacent to the freeway route and is accessible to present and future major roads. It is in an area of moderate grades, shielded from the major entrance road by topography and vegetation.

The ultimate nature of this area will depend on the types of industry attracted to Mindarie, and the type of employment they provide. In simple terms, if a higher proportion of service industry is developed, there will be less need for industrial land as such.

In any event, industrial sites of varying sizes will be provided to accommodate differing needs and will be developed according to standards imposed through caveats or lease requirements.

11.7 Commercial/Community Sites

In forecasting commercial and community requirements, it is not possible or even desirable to predict an exact combination of uses or appropriate location of centres very far into the future. For this reason, a total of approximately 50 hectares has been nominated for several "commercial/community sites" in accordance with present assessments of space requirements.

The sites are located within environmental areas, generally with access from a secondary road or roads, so as to give maximum freedom of choice both to local residents and passers-by.

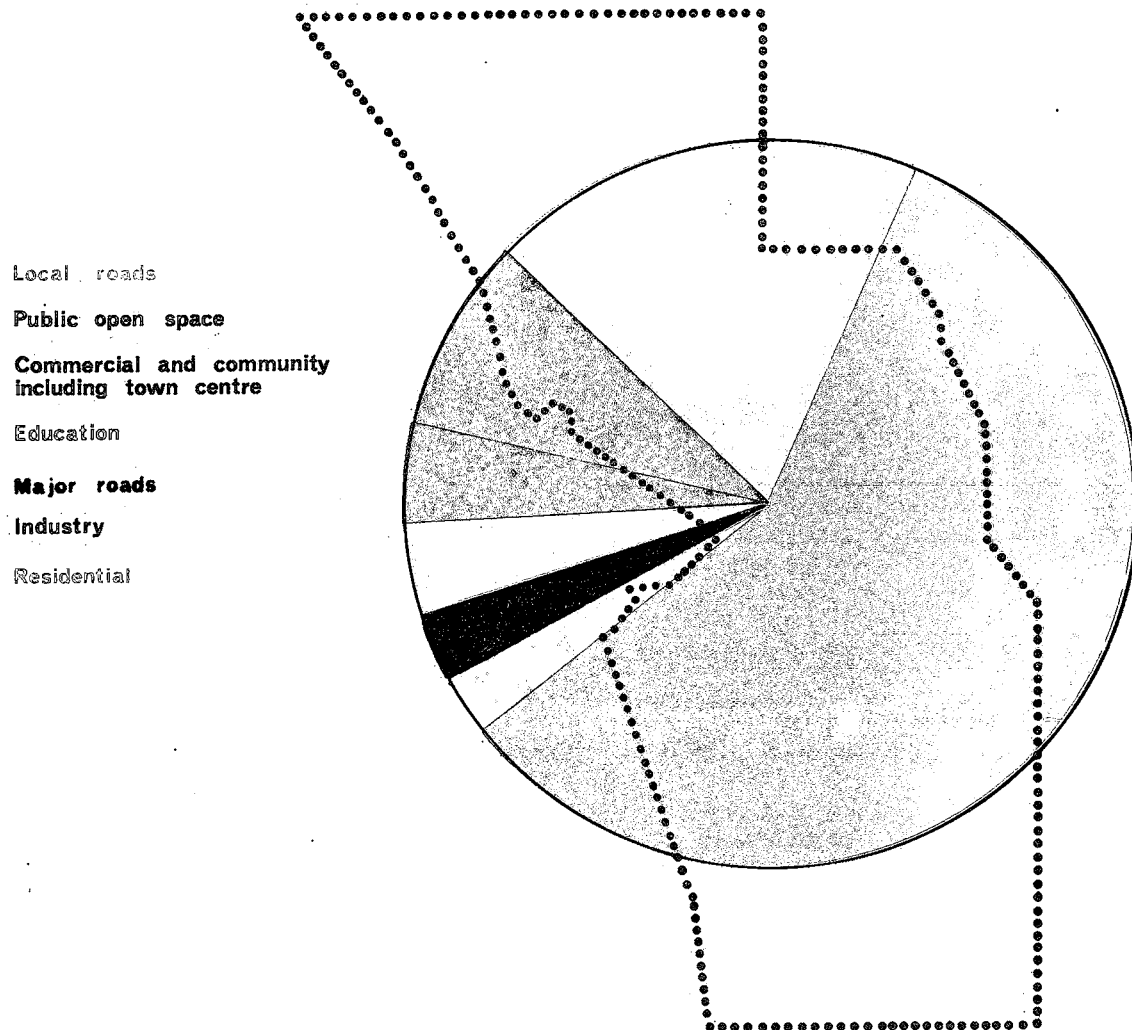
Most but not necessarily all of the sites so nominated would contain a normal range of local convenience shops. Some may also contain such things as a squash court or tavern and in some cases even a hotel. Sites would be available for church and community facilities in different centres according to local needs.

11.8 The Land Use Budget

A preliminary assessment of areas devoted to major land uses has been prepared, based on the Interim Development Plan. The preliminary Land Use Budget is presented as Fig. 23.

As can be seen, if Mindarie is developed as proposed in the Interim Development Plan, 57.40 percent of the land area will be devoted to residential use while local movement and roads will take up a further 19 percent. Thus of the total 3012 hectares, 35 percent or 1054 hectares, will be devoted to roads, public open space or education sites.

PRELIMINARY LAND USE BUDGET



LAND USE	HECTARES	ACRES	PERCENT
Nett residential area	1729	4270	57.40
Public open space	256	632	8.50
Major roads	94	232	3.12
Industry	80	198	2.66
Education	119	294	3.95
Commercial and community	158	390	5.24
Local roads	576	1424	19.13
	3012	7440	100.00

Fig. 23

Appendices

APPENDIX I

INCOME

The technique was based on the relationship between occupation and average annual wage. The analysis was made for the Shire of Wanneroo, the City of Stirling and for the Perth Metropolitan Region, using the Australian Bureau of Statistics population estimates as a base. The labour force was determined using a labour participation rate of 38% for Wanneroo Shire and 40.7% for Stirling and the Perth Region. The occupational distribution was calculated and appropriate average annual income levels allocated to each group. The latter were compiled for each occupation from research of private and public employment agencies, employment bulletins, and newspaper advertisements. Average occupational income was then multiplied by the number of workers in their respective categories to give an aggregate income figure. This total income was then divided by the number of people employed to arrive at an average wage and multiplied by the number of households (calculated from the population estimates on the basis of 3.55 persons/household for Wanneroo, 3.25 for Stirling and 3.3 for Perth Region) to give average household incomes.

GROSS INCOME BY OCCUPATION
CITY OF STIRLING
1974

OCCUPATION		TOTAL EMPLOYED	% DIST. 2)	ESTIMATED TOTAL (\$ PA 4)
Professional	(1-5) ¹⁾	1,163	1.8%	18,608,000
Professional	(6-13)	7,821	12.1%	62,568,000
Administrative	(14-15)	5,235	8.1%	57,585,000
Clerical	(16-18)	12,907	19.97%	67,116,000
Sales Workers	(19)	711	1.1%	3,911,000
Sales Workers	(20)	1,422	2.2%	6,399,000
Sales Workers	(21)	4,136	6.4%	21,507,000
Farmers Etc.	(22-27)	1,163	1.8%	6,048,000
Miners	(28-30)	103	0.16%	567,000
Transport Workers	(31-40)	3,361	5.2%	24,199,000
Craftsmen Etc.	(41-61)	17,515	27.1%	96,333,000
Service Workers	(62-71)	5,882	9.1%	30,586,000
Armed Services	(72)	498	0.77%	2,988,000
Inadequately Described and not stated	(73)	2,715	4.2%	14,118,000
		64,632 ³⁾	100.0%	\$412,533,000

Average Wage = \$6,383
 Using 3.35 persons/household
 Number of private occupied households = 47,403
 Average Household Income = \$8,703

- 1) See attachment A for Occupation Breakdown
- 2) May not equal 100% due to rounding
- 3) Accepting a participation rate of 40.7%
- 4) 1974 Constant Dollars

Source: USC 1974

GROSS INCOME BY OCCUPATION
SHIRE OF WANNEROO
1974

OCCUPATION		TOTAL EMPLOYED	% DIST. 2)	ESTIMATED TOTAL (\$ PA 4)
Professional	(1-5) 1)	158	1.8%	2,528,000
Professional	(6-13)	1,063	12.1%	8,504,000
Administrative	(14-15)	711	8.1%	7,821,000
Clerical	(16-18)	1,753	19.97%	9,116,000
Sales Workers	(19)	97	1.1%	534,000
Sales Workers	(20)	193	22.2%	869,000
Sales Workers	(21)	561	6.4%	2,917,000
Farmers Etc.	(22-27)	158	1.8%	822,000
Miners	(28-30)	14	0.16%	77,000
Transport Workers	(31-40)	456	5.2%	3,283,000
Craftsmen Etc.	(41-61)	2,378	27.1%	13,079,000
Service Workers	(62-71)	799	9.1%	4,155,000
Armed Services	(72)	68	0.77%	408,000
Inadequately Described and not stated	(73)	369	4.2%	1,550,000
		8,778 3)	100.0%	\$55,663,000

Average Wage = \$6,341

Using 3.55 persons/household

Number of Private Occupied Households = 6,507

Average Household Income = \$8,554

1) See attachment A for Occupation Breakdown

2) May not equal 100% due to rounding

3) Accepting a participation rate of 38%

4) 1974 Constant Dollars

Source: USC 1974

GROSS INCOME BY OCCUPATION
PERTH METROPOLITAN REGION
1974

OCCUPATION		TOTAL EMPLOYED	% DIST. 2)	ESTIMATED TOTAL (\$ PA 4)
Professional	(1-5) 1)	3,309	1.1%	52,944,000
Professional	(6-13)	30,988	10.3%	247,904,000
Administrative	(14-15)	22,263	7.4%	244,893,000
Clerical	(16-18)	55,960	18.6%	290,992,000
Sales Workers	(19)	2,407	0.8%	13,239,000
Sales Workers	(20)	3,309	1.1%	14,891,000
Sales Workers	(21)	22,263	7.4%	115,768,000
Farmers Etc.	(22-27)	7,521	2.5%	39,109,000
Miners	(28-30)	903	0.3%	4,967,000
Transport Workers	(31-40)	17,149	5.7%	123,473,000
Craftsmen Etc.	(41-61)	93,566	31.1%	514,613,000
Service Workers	(62-71)	25,873	8.6%	134,540,000
Armed Services	(72)	3,008	1.0%	18,048,000
Inadequately Described and not stated	(73)	12,335	4.1%	64,142,000
		300,854 3)	100.0%	\$1,879,523,000

Average Wage = \$ 6,247

Using 3.3 persons/household

Number of private occupied households = 224,000

Average Household Income = \$ 8,390

1) See attachment A for occupation breakdown

2) May not equal 100% due to rounding

3) Accepting a participation rate of 40.7%

4) 1974 Constant Dollars

Source: USC 1974

ATTACHMENT A

OCCUPATION

PROFESSIONAL, TECHNICAL AND RELATED WORKERS

1. Architects, Engineers, Surveyors, Professionals
2. Chemists, Physicists, Other Physical Scientists
3. Biologists, Vets, Agronomists, Related Scientists
4. Medical Practitioners
5. Dentists
6. Nurses including trainees
7. Professional Medical Workers
8. Teachers
9. Clergy and Members of Religious Orders
10. Law Professionals
11. Artists, Entertainers, Writers, Related Workers
12. Draftsmen and Technicians
13. Other Professional, Technical and Related Workers

ADMINISTRATIVE, EXECUTIVE AND MANAGERIAL WORKERS

14. Administrative and Executive Officials, Government
15. Employers, Managers, Workers own account

CLERICAL WORKERS

16. Book-keepers and Cashiers
17. Stenographers and Typists
18. Other Clerical Workers

SALES WORKERS

19. Insurance, Real Estate, Salesmen, Valuers
20. Commercial Travellers, Manufacturers Agents
21. Proprietors, Shopkeepers, Shop Assistants Etc.

FARMERS, FISHERMEN, ETC. AND RELATED WORKERS

22. Farmers and Farm Managers
23. Farm Workers Including Farm Foremen
24. Wool Classers
25. Hunters and Trappers
26. Fishermen and Related Workers
27. Timber Getters

MINERS, QUARRYMEN AND RELATED WORKERS

28. Miners, Mineral Prospectors and Quarrymen
29. Well Drillers, Oil, Water and Related Workers
30. Mineral Treaters

WORKERS IN TRANSPORT AND COMMUNICATION

31. Deck and Engineer Officers - Ship
32. Deck, Engineroom Hands, Ship and Boatmen
33. Air Pilots, Navigators, Flight Engineers
34. Drivers and Firemen, Rail Transport
35. Drivers, Road Transport
36. Guards and Conductors - Railway
37. Inspectors, Supervisors, Controllers
38. Telephone, Telegraph, Telecom. Operators
39. Postmasters, Postmen and Messengers
40. Workers in Transport and Communication

TRADESMEN, PRODUCTION-PROCESS WORKERS AND LABOURERS, NEC

41. Spinners, Weavers, Knitters, Dyers and Related
42. Tailors, Cutters, Furriers, Related Workers
43. Leather Cutters, Lasters, Sewers and Related
44. Furnacemen, Rollers, Moulders, Metal Makers
45. Instrument Makers, Jewellers and Related Workers
46. Metal Tradesmen, Mechanics Etc .
47. Electricians and Related Workers
48. Metal and Electrical Prod. - Process Workers
49. Carpenters, Wood Machinists Etc.
50. Painters and Decorators
51. Bricklayers, Plasterers, Construction Workers
52. Printing Trades Workers
53. Pottery, Glass and Clay Workers
54. Millers, Bakers, Food and Drink Workers
55. Chemicals, Sugar, Paper, Prod. - Process Workers
56. Tobacco Product Makers
57. Rubber, Plastic, Concrete Prod. - Process Workers
58. Packers, Wrappers, Labellers
59. Stat. Engine, Excavating, Lifting Operators
60. Storemen and Freight Handlers
61. Labourers and Not Included Elsewhere

SERVICE, SPORT AND RECREATION WORKERS

62. Fire Brigade, Police and Protective Workers
63. Housekeepers, Cooks, Maids Etc.
64. Waiters, Bartenders
65. Caretakers, Cleaners - Buildings
66. Barbers, Hairdressers and Beauticians
67. Launderers, Dry Cleaners and Pressers
68. Athletes, Sportsmen and Related Workers
69. Photographers and Camera Operators
70. Undertakers and Crematorium Workers
71. Service, Sport, Recreation Workers

MEMBERS OF ARMED FORCES

72. Members of Armed Services

OCCUPATION INADEQUATELY DESCRIBED OR NOT STATED

73. Inadequately Described or Not Stated

APPENDIX II

ROAD DESIGN CRITERIA

Mitchell Freeway

Design speed	120 km per hour
Reserve width	82m (minimum)
Median width	20m
Carriageways	Two x 14.8m
	Eight lanes
Intersections	None at grade
	Grade separated interchanges
	6 km to 8 km apart
	Vehicle underpasses and over-
	bridges required through
	residential areas
	Underpasses at regional open
	spaces
Maximum Grade	3%
Access to adjacent lots	Not permitted
Footpaths	None

Marmion Avenue

Design Speed	80 km per hour
Reserve width	60m (minimum)
Median width	14m
Carriageways	Two x 11m
	Six lanes
Intersections	Tee form, minimum spacing
	400m
	Pedestrian underpasses and
	overbridges in residential areas.
	Underpasses in regional open
	spaces
Maximum Grade	6%
Access to adjacent lots	Indirect access permitted through
	frontage service road
Footpaths	Where residential areas adjoin

East-West Arterial

Design speed	80 km per hour
Reserve width	60m (minimum)
Median width	14m
Carriageways	Two x 11m
Intersections	Tee form, minimum spacing
	200m
	Pedestrian underpasses and
	overbridges

Maximum Grade
Access to adjacent lots
Footpaths

6%
Indirect access permitted
through frontage service road
Where residential areas adjoin

West Coast Road

Design speed
Reserve width
Median width
Carriageways
Intersections

55 km per hour
30m
None
One x 10.7m
Tee form. Underpasses to
provide access to beach.

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