



**Water and Rivers
Commission**

The Water and Rivers Commission is amalgamating with
the Department of Environmental Protection to form the
Department of Environment, Water and Catchment Protection

MANAGING THE WATER RESOURCES OF THE GINGIN GROUNDWATER AREA, WA

Interim Sub-Regional Allocation Strategy

Prepared by
Resource Allocation Branch of
Resource Management Division
and Swan Goldfields Agricultural Region

October 2002

ISBN: 0-7309-7574-6

SUMMARY

The groundwater resources of the Gingin Groundwater Area are either fully allocated or approaching full allocation in some subareas. Demand in recent years for licences to explore for or to abstract groundwater, has been increasing in some subareas to a level that cannot be sustained in the long term. In recognition of the need to manage this increasing demand, the Department of Environment, Water and Catchment Protection will develop a Sub-Regional Groundwater Management Plan for the Gingin Groundwater Area in consultation with the community and the proposed Water Resources Management Committee. The new Plan will address the environmental requirements and include full community consultation consistent with the amended *Rights in Water and Irrigation Act (1914)*.

The Department has drafted this Interim Allocation Strategy to manage the groundwater resources in the period prior to implementations of the new Plan. This Strategy is the first published review of the 1993 Gingin Groundwater Area Management Plan (Water Authority of Western Australia, 1993) and reports on the issues and topics related to the management of the groundwater resources in the Gingin Groundwater Area. In particular, it will ensure the groundwater resources are managed at the appropriate level in the interim. The Water and Rivers Commission re-assessed the 1993 Gingin Groundwater Area Management Plan in 2000 (Water and Rivers Commission, 2000), however since then, the Department has re-evaluated the interim Allocation Limits in the eastern portion of the Groundwater Area and proposed new allocation principles by reviewing the *first in - first served* principle.

A new Allocation Limit of 11,000 ML/yr (previously 6,300 ML/yr) has been assigned to Subarea 4 following a review of the hydrogeology of the northern Perth Basin and a more equitable distribution of the resource.

This draft Strategy has been developed based on the current knowledge of the groundwater resources and adopts a precautionary approach to water allocation to ensure that the groundwater resource and its beneficial uses are sustained in the long term. The Department will continue to review the Allocation Limits as new hydrogeological and water usage data and information become available.

Operationally, this document will ensure that licence applications and approvals are processed where groundwater is available for allocation. Applicants are informed of areas where groundwater is fully committed to avoid needless expectations. Developers are able to obtain information about the status of the groundwater resource before committing to capital investments. This should encourage licence applicants to tap into groundwater resources that are not fully committed, such as the Superficial aquifer in some parts of the coastal area of the Groundwater Area.

This Draft Interim Allocation Strategy does not contain all the technical details regarding the physical aspects of the Gingin Groundwater Area. This is intentional, as the Strategy should be viewed as an operational document. Full technical details are available from the supporting documentation to which the reader is referred.

TABLE OF CONTENTS

SUMMARY

1	INTRODUCTION	1
1.1	Objective of the Strategy	1
1.2	Gingin Groundwater Area	2
1.3	Background	5
1.4	Legislative and Policy Framework	5
1.5	Current Investigations	7
2	GROUNDWATER RESOURCE AND RECHARGE CHARACTERISTICS	7
2.1	Unconfined Aquifers	7
2.2	Semi-confined to Confined Aquifers	8
2.3	Fractured Rock Aquifers	13
3	SUSTAINABILITY PRINCIPLES	13
3.1	Environmental Considerations – EWR/EWP Principles	13
3.2	Sustainable Yield / Allocation Limit Relationship	14
3.2.1	Allocation Limit	14
4	WATER AVAILABILITY	15
4.1	Climate Change	18
4.2	Risks Associated with the Interim Allocation Limits	19
4.3	Public Water Supply Held in Reserve	19
5	GROUNDWATER LICENSING GUIDELINES	20
6	ALLOCATION PRINCIPLES	20
6.1	The Merit Selection Process	22
7	TRADEABLE WATER ENTITLEMENTS	25
8	PROPOSED GROUNDWATER RESOURCES MANAGEMENT COMMITTEES	26
9	CONCLUSIONS	26
10	CONTACT FOR FURTHER INFORMATION	27
11	REFERENCES	28
12	SUPPORTING DOCUMENTS	29

LIST OF FIGURES

1	Gingin Groundwater Area – Subareas for Unconfined and Semi-confined Aquifers	3
2	Gingin Groundwater Area – Subareas for Confined Aquifers	4
3	Gingin Groundwater Area – Superficial and Surficial Aquifers	9
4	Gingin Groundwater Area – New Recognised Aquifers	10
5	Gingin Groundwater Area – Leederville and Leederville-Parmelia Aquifers	11
6	Gingin Groundwater Area – Yarragadee Aquifer	12
7	Mechanism for water Allocation	24

LIST OF TABLES

1	Subareas of the Gingin Groundwater Area	2
2	Aquifers of the Gingin Groundwater Area	7
4	Current Public Water Schemes and Reserves in the Gingin Groundwater Area	20

APPENDICES

A	Calculation of Allocation Limits	
B	Allocations and Groundwater Availability per Subarea in the Gingin Groundwater Area	
C	Allocations and Groundwater Availability per Aquifer in the Gingin Groundwater Area	
D	Groundwater Licensing Guidelines	
E	Licensing Information Pamphlets	

1 INTRODUCTION

The Department of Environment, Water and Catchment Protection (Department) manages the water resources of Western Australia in partnership with other government agencies, businesses and the community. The Department's primary role is to ensure the State's water resources are appropriately managed to support sustainable development and conservation of the environment for the long-term benefit of the community. This is achieved through a water allocation, policy and licensing process, which ensures that water is used efficiently and within sustainable limits.

The groundwater resources in some subareas of the Gingin Groundwater Area (GGA) are either fully allocated or approaching full allocation. Over the past two years, the Department has received a large number of applications for accessing significant quantities of groundwater in the GGA placing additional pressure on the resource to satisfy the demand. In some subareas the demand exceeds supply, which if satisfied, could threaten the long-term sustainability of these resources. This Interim Allocation Strategy has been prepared by the Department to provide information to organisations, industry and individuals about the way in which the groundwater resources of the GGA are to be managed until a Sub-Regional Groundwater Management Plan can be developed and implemented in the GGA.

This Strategy should be considered as a precursor to the Management Plan, which will be developed in consultation with community groups and stakeholders in the area. The Management Plan will review the Allocation Limits as presented in this Strategy following a detailed assessment of the ecological water requirements and determination the groundwater regime required to protect the environmental values.

The interim Allocation Limits, which have been estimated for each of the aquifers identified in the GGA, are based on the available information and varying levels of certainty. To finalise the review and introduce a higher level of certainty, additional information will need to be collected, evaluated and reported on in the forthcoming Management Plan. Consequently, this Strategy adopts a precautionary approach to ensure that the groundwater resource, and its beneficial uses and environmental values, are sustained in the long term.

This Interim Allocation Strategy was available for public comment for a period of six weeks from the date of release. All groundwater licence holders and any person or organisation interested in the management of the water resources in the GGA are encouraged to carefully read this document.

1.1 Objective of the Strategy

Groundwater management in Western Australia is based on a partnership arrangement between the community and government. Whilst this process works well, there is a need to apply consistent and objective criteria when allocating resources, and at the same time, protect the natural environment dependent on these resources. The objective of this Interim Strategy is to allocate groundwater for consumptive use in a way that contributes to the fullest extent possible, the sustainable economic and social

development of the GGA whilst protecting key ecological values of groundwater dependent ecosystems.

The guidelines and initiatives for achieving this objective are contained in this document. It sets out the reasoning for the decisions and implements a set of licensing rules that will ensure the resource is allocated in a fair manner and used in a sustainable way.

1.2 Gingin Groundwater Area (GGA)

The GGA is located in the northern Perth Basin, between 40 km and 150 km north of Perth and covers an area of about 6147 km² (Figure 1). The Area contains very large groundwater resources in storage in at least 11 aquifer systems and has been subdivided into 23 Subareas for closer management as shown in Figures 1 and 2, and Table 1.

Table 1. Subareas of the Gingin Groundwater Area

Subarea	Generalised geomorphology
Beermullah Plain	Bassendean Dunes and Pinjarra Plain
Bindoon	Darling Plateau and Dandaragan Plateau
Deepwater Lagoon	Bassendean Dunes and Pinjarra Plain
Eclipse Hill	Pinjarra Plain and Dandaragan Plateau
Gingin Township	Dandaragan Plateau and Darling Plateau
Guilderton	Coastal Belt
Karakin Lakes	Coastal Belt
Lake Mungala	Bassendean Dunes and Pinjarra Plain
Lancelin	Coastal Belt
Moora	Yarra Yarra Region
Namming Lakes	Bassendean Dunes and Dandaragan Plateau
North Moore River Park	Bassendean Dunes
Red Gully	Dandaragan Plateau and Yarra Yarra Region
Seabird	Coastal Belt
South Moore River Park	Bassendean Dunes and Pinjarra Plain
Victoria Plains	Dandaragan Plateau and Yarra Yarra Region
Wedge Island	Swan Coastal Plain, Arrowsmith Region and Dandaragan Plateau
Subarea 1	Coastal Belt, Bassendean Dunes and Arrowsmith Region
Subarea 2	Coastal Belt, Bassendean Dunes and Pinjarra Plain
Subarea 3	Coastal Belt, Bassendean Dunes and Pinjarra Plain
Subarea 4	Dandaragan Plateau and Yarra Yarra Region
Subarea 5	Dandaragan Plateau, Yarra Yarra Region and Darling Plateau
Subarea 6	Pinjarra Plain, Dandaragan Plateau and Darling Plateau

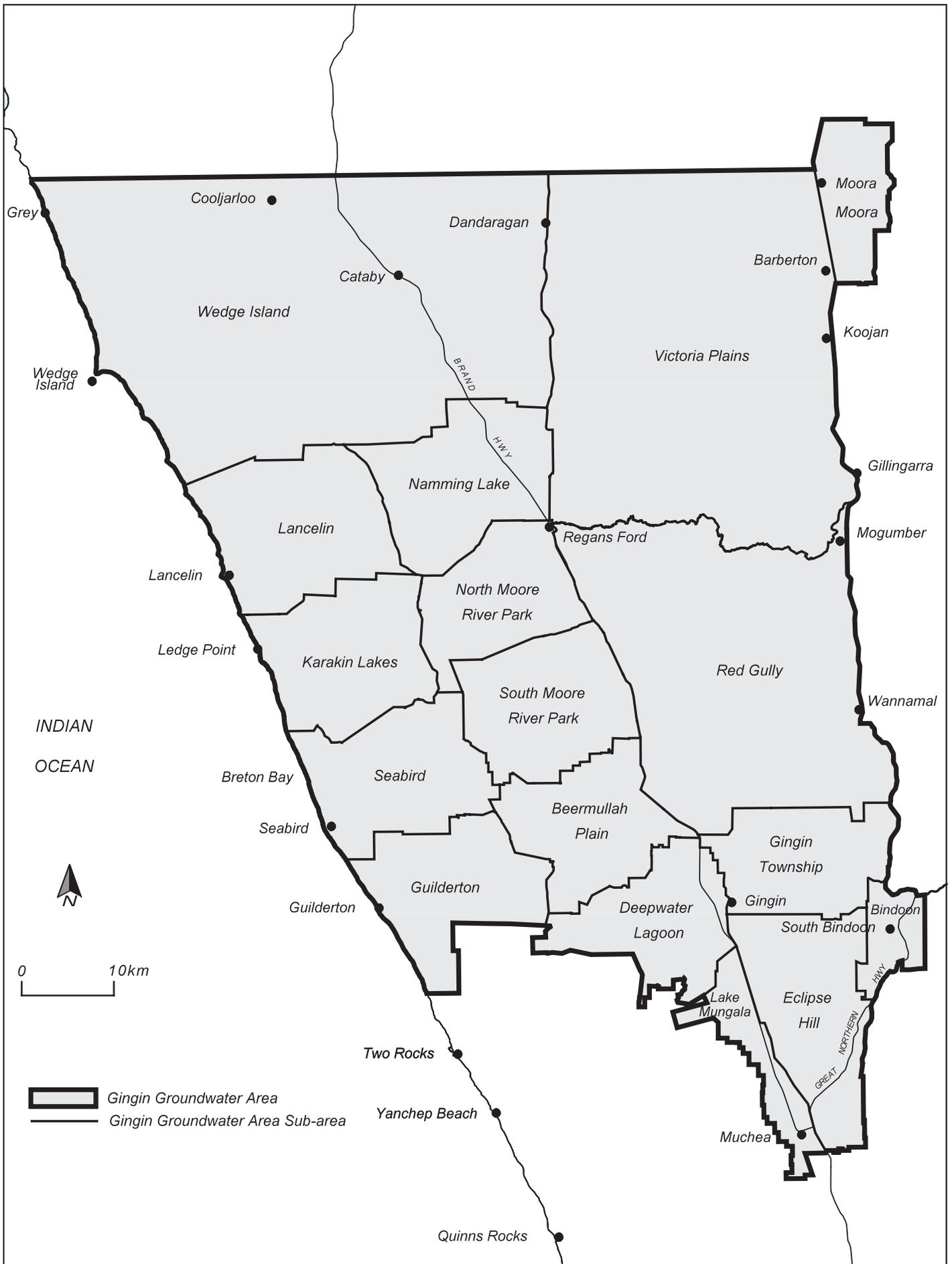


Figure 1. Gingin Groundwater Area - Subareas for unconfined and semi-confined aquifers

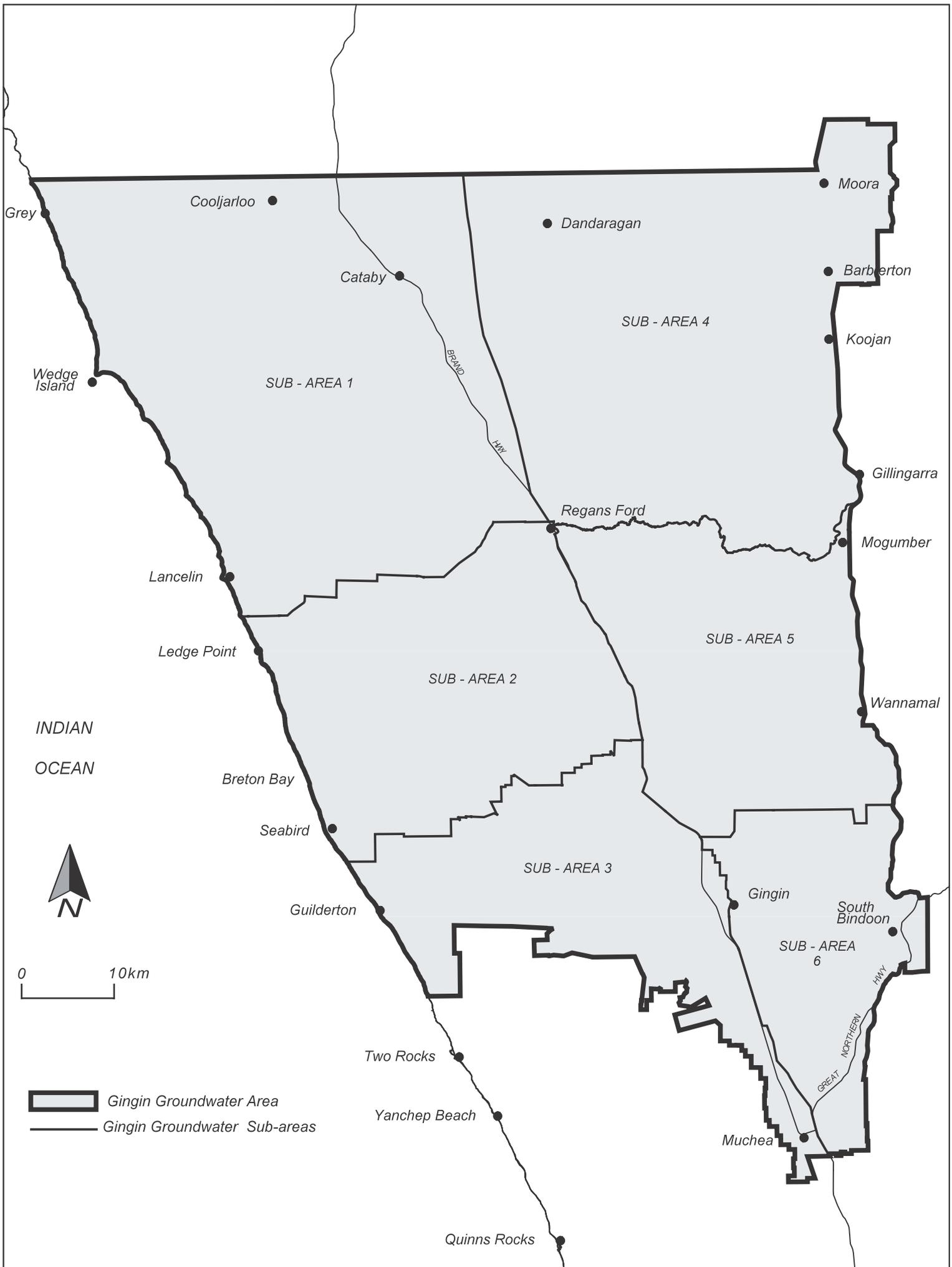


Figure 2. Gingin Groundwater Area - Sub-areas for confined aquifers

The GGA, together with the Jurien and Arrowsmith Groundwater Areas to the north, form part of the northern Perth Basin. The GGA is administered by the Department's Swan Goldfields Agricultural Regional office located in Perth (refer to Section 10).

1.3 Background

To address the importance of the groundwater resources in the northern Perth Basin and the future demand for these resources, the *Gingin Groundwater Area Management Plan* was developed in 1993 by the Water Authority (Water Authority of Western Australia, 1993). The Allocation Limits currently used for licensing groundwater allocation in the subareas are contained in the 1993 Plan. However, these Allocation Limits do not account for the environmental values at the level now required by the national water reform initiatives and the State's amended *Rights in Water and Irrigation Act (1914)*. The Allocation Limits in the 1993 Plan cannot therefore be substantiated without further investigation into the environmental and ecological requirements. In addition, full community consultation is now required when developing a Management Plan.

In 2000, the Commission produced an Allocation Strategy (Water and Rivers Commission, 2000) as an interim measure for the period prior to implementation of a new Groundwater Management Plan for the GGA. More recently, the Commission prepared Interim Allocation Strategies for the Jurien and Arrowsmith Groundwater Areas (Water and Rivers Commission, 2001a and b). For consistency, this Strategy has been prepared in a similar format. It includes new hydrogeological information (Kay and Diamond, 2001) and allocation principles that will ensure the groundwater resources are managed at the appropriate level in the interim.

1.4 Legislative and Policy Framework

Groundwater management in Western Australia is guided by legislation, regulations, policies and strategies at the national and State level. Predominantly it is State legislation that governs decision making on water management issues within the GGA.

National Policy

National Strategy for Ecologically Sustainable Development (1992)

This policy establishes the need to develop and manage, in an integrated way, the quality of water resources and to develop mechanisms that aim to maintain ecological systems whilst meeting economic and social needs.

National Strategy for Conservation of Australia's Biological Diversity (1993)

This strategy commits governments to:

- Improve knowledge about biological diversity; and
- Protect ecosystems through legislation and policy.

Strategic Framework for Water Reform, COAG (1994)

The Council of Australian Governments Water Reform Framework Agreement outlines reforms of the nation's water resources. All States are required to pursue these reforms. Amongst many others, the COAG Water Reforms pertinent to the CGA are:

- Sustainable use of the water resources;
- Provision of water for the environment; and
- Establishment of a Tradeable Water Entitlement (TWE) market.

National Principles for the Provision of Water for Ecosystems (1996)

Agricultural and Resource Council of Australia and New Zealand (ARMCANZ) goal for providing water for the environment is to 'sustain and where necessary restore ecological processes and biodiversity of water dependent ecosystems'.

Allocation and Use of Groundwater – A National Framework for Improved Groundwater management in Australia (1996)

ARMCANZ recognised that groundwater has economic and social importance and has major potential impacts on the wider natural resource base. The Framework sets out 12 recommendations regarding the sustainable use of groundwater.

State Legislation and Policy

Groundwater allocation and conservation is administered by the Department in accordance with the *Rights In Water and Irrigation Act 1914 (RIWI Act)* as amended. This Act is the primary instrument for water management and regulation in Western Australia.

Under the *RIWI Act*, the right to use, flow and control groundwater is reserved in the Crown. This Act requires the compulsory licensing of groundwater bores in the GGA, except where a right is conferred by either an exemption order under section 26C or local by-law created under section 26L of the Act.

Regulatory controls are designed:

- To encourage the responsible development of groundwater resources and limit abstraction from the aquifer to a level which can be sustained over the long-term;
- To allocate resources for beneficial private and public purposes and to meet the environmental requirements of the area;
- To enable the resources to be shared in an equitable manner; and
- To protect present and future sources of groundwater for public water supplies and for private use, where appropriate.

A list of recent Department's policy documents is provided in Section 12.

1.5 Current Investigations

The Department is carrying out the following work to assist in developing appropriate allocation policies:

- Determination of the groundwater dependent ecosystem and level of dependency in the region (refer to section 3.1). The results of this preliminary study will determine the water requirements of any groundwater dependent ecosystems (Ecological Water Requirements) and how much water will be provided to the environment taking the social and economic values into consideration (Environmental Water Requirements).
- Development and testing of the Perth Region Aquifer Modelling System (PRAMS), which includes the whole Gingin Groundwater Area (Yu *et al.*, 2002).

2 GROUNDWATER RESOURCES AND RECHARGE CHARACTERISTICS

The groundwater resources of the GGA are contained in 10 sedimentary aquifers and one fractured rock aquifer as shown in Figures 3 to 6 and Table 2. Of the 11 aquifers, the Superficial, Leederville, Leederville-Parmelia and Yarragadee aquifers provide most water for public water supply, agriculture and mining.

Table 2. Aquifers of the Gingin Groundwater Area

Unconfined aquifer	Semi-confined to confined aquifer
Superficial	Poison Hill
Surficial	Mirrabooka
	Leederville
	Leederville -Parmelia
	Yarragadee
	Cattamarra
	Eneabba
	Lesueur
Fractured bedrock	

2.1 Unconfined Aquifers

The Superficial aquifer forms an extensive shallow unconfined aquifer system containing large groundwater resources held in sand, gravel and limestone (Moncrieff and Tuckson, 1989; Kern, 1993). Properly constructed production bores tapping this system are capable of yielding up to 25 L/s (2000 m³/day). The groundwater is generally fresh with a salinity of less than 1000 mg/L Total Dissolved Solids (TDS).

The extent of the Superficial aquifer in Figure 3 is extensive, however occurs only locally (Kay and Diamond, 2001). The “Barn Road aquifer”, which occurs east of Gingin, falls into this category. Bores yields are generally small (less than 1 L/s or 100 m³/day), however the groundwater is generally fresh.

In general, recharge to the unconfined aquifers is mainly from direct rainfall infiltration. However, there may be recharge from the underlying aquifers in the coastal area, however this has yet to be quantified. The impacts of pumping are generally localised and the throughflow component is small. For this reason, the unconfined aquifers of the GGA have been divided into relatively small subareas for closer management (Figure 1).

2.2 Semi-confined to Confined Aquifers

The semi-confined to confined aquifers (Figures 2, 4, 5 and 6) are hydraulically connected with the overlying Superficial or Surficial aquifers (Figure 3) and are recharged from groundwater that infiltrates vertically from the overlying sediments (Moncrieff, 1989; Kern, 1993; Davidson, 1995). Recharge is generally high where the aquifers are semi-confined, however recharge is limited where they are confined. In the eastern portion of the GGA, the Leederville-Parmelia aquifer is overlain by a thick confining layer of fairly impervious shale, which restricts vertical leakage. In the same area, the Yarragadee aquifer is also overlain by a layer of impermeable material, which restricts vertical recharge to this aquifer system. In the coastal area, there is also less local recharge to the confined aquifers because groundwater flow is predominantly upward. The smaller recharge for these aquifers has resulted in a reduction of the Allocation Limit and hence a reduction in the water available for allocation. The Commission has set new Allocation Limits for the Leederville-Parmelia aquifer in the northern Perth Basin (WRC, 2001a and b) based on a more equitable distribution of the resource. This means that there is now more groundwater available in Subarea 4.

The semi-confined and confined aquifers form extensive deep aquifers providing yields of up to 60 L/s (5000 m³/day). Groundwater is generally fresh except in most aquifers along the Darling Scarp in the east, and in the Yarragadee aquifer in the coastal area south of Lancelin. The high salinity along the Darling Scarp is most likely caused by leakage from the saline Yarra Yarra Lake system. The Cattamarra aquifer contains brackish groundwater.

Review of the hydrogeology (Water and Rivers Commission, 2000, Kay and Diamond, 2001) and the reinterpretation of the recharge and discharge areas have resulted in some reduction in Allocation Limits:

- The Leederville aquifer in the coastal area is overlain by thick confining shale, hence reducing rainfall recharge resulting in a reduction of the Allocation Limit;
- No recharge from rainfall is taking place in the Leederville and Yarragadee aquifers in the coastal area north of Lancelin because the groundwater flow has been found to be predominantly upward;

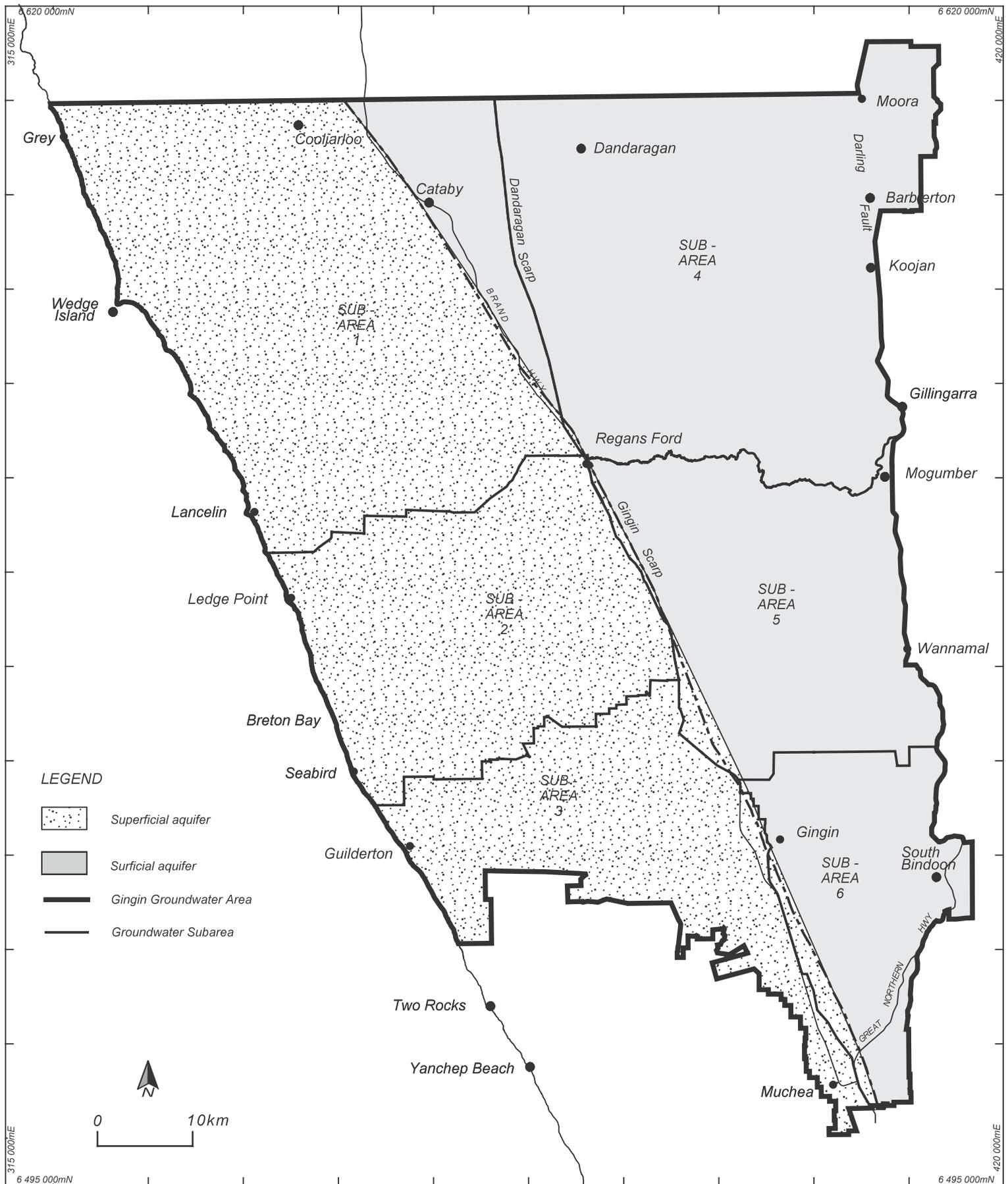


Figure 3. Gingin Groundwater Area - Superficial and surficial aquifers

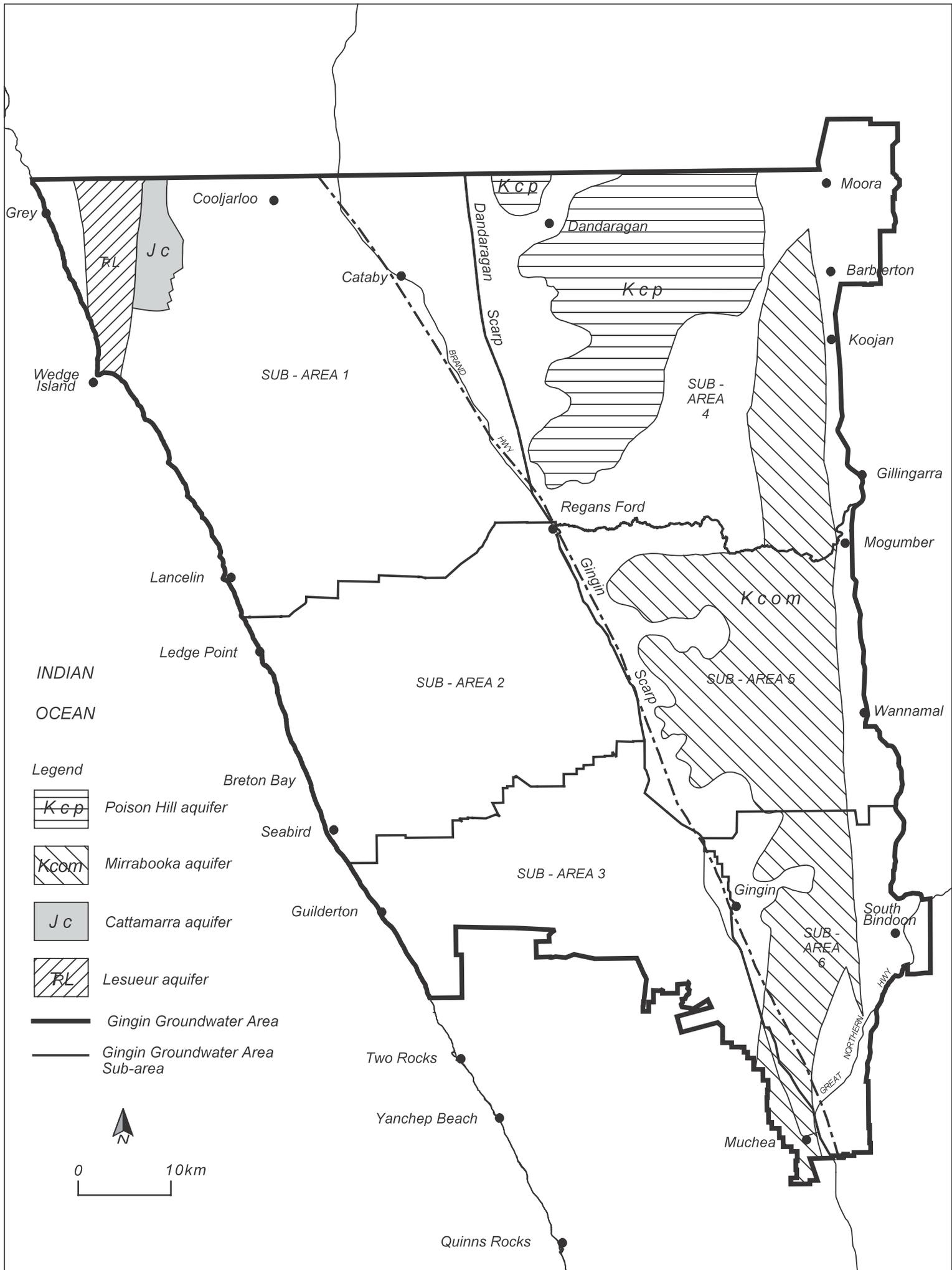


Figure 4. Gingin Groundwater Area - New recognised aquifers

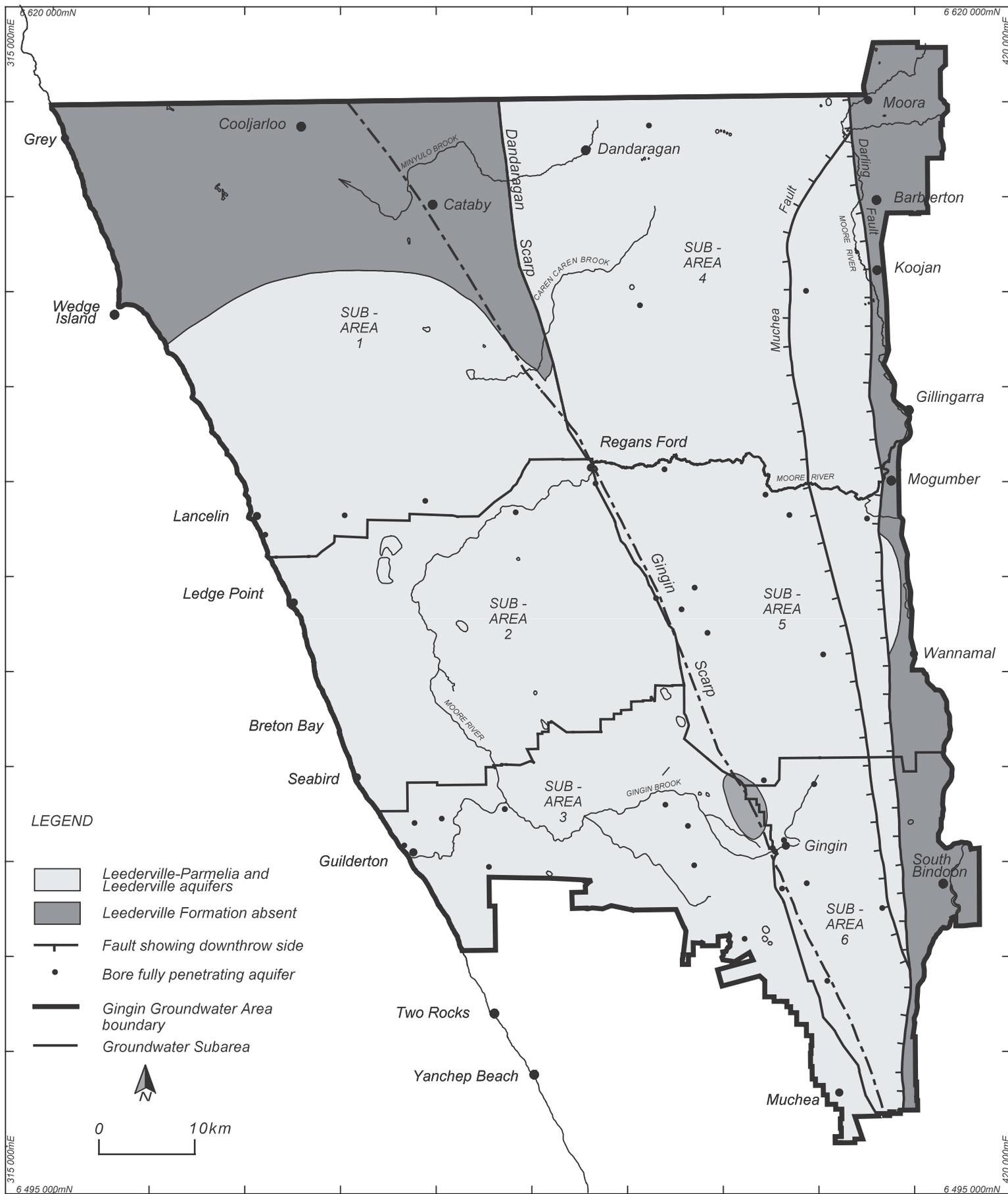


Figure 5. Leederville and Leederville-Parmelia aquifers

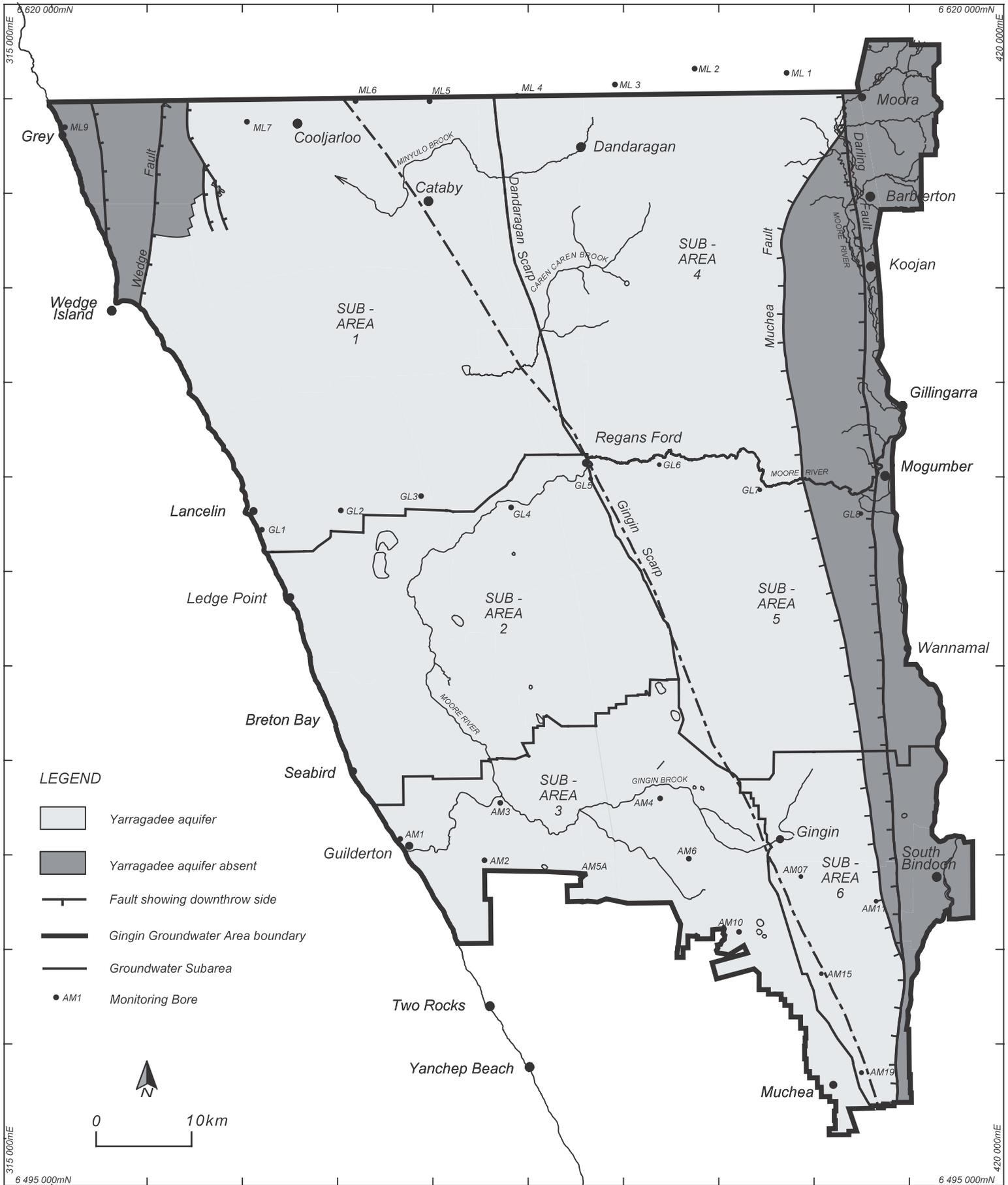


Figure 6. Yarragadee aquifer

- The Leederville aquifer is hydraulically connected with the Parmelia aquifer in the eastern portion of the GGA, forming a single aquifer system, the Leederville-Parmelia aquifer; and
- The Leederville-Parmelia aquifer is overlain by thick confining shale covering most of the eastern portion of the GGA, hence reducing rainfall recharge resulting in a reduction of the Allocation Limit.

In general, recharge to the unconfined aquifers is based on direct rainfall infiltration while recharge of the semi-confined and confined aquifers is based on downward leakage of groundwater from the overlying unconfined aquifers and throughflow from the recharge areas. There has been no direct measurement of recharge rates in the GGA hence the recharge rates for this Strategy are based on extrapolation from estimates elsewhere in the Perth Basin, and an understanding of hydrogeological principles. As such, the rates are fairly conservative, and will remain so until further work can be undertaken to increase the level of confidence.

2.3 Fractured Rock Aquifers

Generally, the fractured rock aquifers east of the Darling Scarp have a small storage capacity and provide low bore yields of up to 6 L/s (500 m³/day) from highly fractured and weathered zones. The groundwater quantity and quality however, are highly variable.

3 SUSTAINABILITY PRINCIPLES

Sustainability must foster a long-term perspective to the management of groundwater resources in the GGA. Firstly, groundwater has two major components, a non-renewable (not in our lifetime) component (storage) and a renewable component (recharge). For long-term sustainability to occur, only the renewable component should be used and the rate of usage should not be continuously greater than recharge.

Secondly, the effects of both current and future development must be considered in any management strategy. Thirdly, the long-term effects of pumping, such as salt-water intrusion, are not instant. They manifest themselves slowly over time, sometimes after many years, and these delays must be recognised and managed. Finally, temporary losses from storage (pumping in excess of recharge) can be tolerated however continuous losses from storage cannot and must not be permitted. Temporary losses should be balanced by intervening additions to storage. By ensuring this happens with proper management, there is no reason why the GGA should not continue to provide an assured supply of good quality water in perpetuity.

3.1 Environmental Considerations – EWR / EWP Principles

The management of groundwater allocation includes the determination of specific criteria, including the volume of water, required to sustain ecosystems dependent on this water. This requirement is formally known as the Ecological Water Requirement

(EWR). EWRs are determined through the identification of values and beneficial uses and the subsequent establishment of constraints such as critical water levels in wetlands; rates of groundwater flow to discharge zones; sufficient throughflow to maintain the salt water interface; etc.

The volume of water that will actually be provided to the environment is formally known as the Environmental Water Provision (**EWP**), and for groundwater systems, the EWRs are usually represented as a water level regime. EWPs include the determination of the social and economic values that would be impacted upon if the full EWRs were to be allocated to the environment. Clearly, some groundwater dependent ecosystems (wetlands, cave systems, etc.) must be afforded full protection by providing them their full EWRs. Conversely, other groundwater dependent ecosystems should perhaps not be given full protection if it results in unacceptable social and economic impacts. The objective is to strive for a sensible balance between the environmental requirements and the social/economic realities. This balance must be agreed to and provided through active community consultation and participation in the decision making processes. However, Environment Protection Authority (EPA) approval is required (Statewide Policy No. 5, refer to Section 12) if EWPs are to be less than EWRs. The notion of sustainability therefore, takes the above into consideration.

Section 1.5 details current investigations that will determine the water requirements and provisions for groundwater dependant ecosystems. This information will be presented in detail within the Sub-regional Groundwater Management Plan that will follow this Strategy.

3.2 Sustainable Yield / Allocation Limit Relationship

The Sustainable Yield of an aquifer system is difficult to quantify and will always be subject to some degree of uncertainty, depending on the level of available data and information. It relates to a pumping regime that, if continuously exceeds the Sustainable Yield, will cause water levels and/or pressures to decline and water quality to deteriorate, both of which threaten the ability of the aquifer system to supply the required quantity and quality of groundwater in perpetuity, and adversely impact groundwater dependent environmental values.

Total licensed allocations in all subareas in all aquifers will not be permitted to exceed the Allocation Limit as determined in this Strategy. Appendices B and C provide the Allocation Limit and the water availability for each aquifer (if present) in each subarea in the GGA.

3.2.1 Allocation Limit

The Allocation Limit is related to the Sustainable Yield and can be described as the lower limit of the Sustainable Yield uncertainty. As the uncertainty narrows with more data and information, the Allocation Limit will, in most cases, increase. The Department sets an Allocation Limit for every aquifer system in every subarea to ensure that aquifer utilisation is sustainable. This is achieved by monitoring water levels and quality changes over time.

The Allocation Limit is the maximum level of allocation (including public water supply held in reserve) as authorised by the Department, that can be utilised on an annual basis, which allows acceptable levels of pumping stress, and protects dependent economic, social and environmental values. The Allocation Limits are set by considering aquifer recharge, the water requirements of dependent ecosystems (EWRs), and the volume of water that will be provided to the environment taking into account social and economic impacts of such a provision (EWPs). The Department will take a precautionary approach when allocating water for consumptive use. To take a non-precautionary approach may result in an unacceptable risk to both the groundwater dependent ecosystem and the individual enterprise relying on the aquifer system.

The Allocation Limit for each aquifer is derived from a percentage of rainfall recharge over the area in which the aquifer occurs taking into account land use in the area (Appendix A). In addition, preliminary EWRs have been accounted for in this process. The Allocation Limit on a subarea basis for each aquifer is derived from the percentage of rainfall recharge over the portion of the subarea in which the aquifer occurs. An exception to this principle is for the Leederville-Parmelia aquifer in the eastern portion of the GGA. The methodology used here is based on a percentage of rainfall recharge over the whole aquifer system, which stretches from the Alexander Morrison National Park in the north to Muchea in the south, and redistributed on a subarea basis (Appendix A). This allocation approach was adopted because most of the Leederville-Parmelia aquifer south of Watheroo is confined by thick shale restricting recharge. The approach allows for more equitable distribution of the available resource.

The detailed EWRs and EWPs have not as yet been determined for the GGA, hence the Allocation Limits in this document should be considered as interim only. The Department has set preliminary EWRs for the Superficial and Surficial aquifers representing 20% of rainfall recharge based on land use and conservative estimates in other parts of the Perth Basin. This means that 80% of rainfall recharge is available for consumptive use. This estimate takes into account wetlands, groundwater dependent vegetation as well as the static location of the saltwater interface along the coastline. The Department has identified areas of groundwater discharge (upward groundwater flow) for the semi-confined and confined aquifers and this should allow for maintenance of springs and groundwater dependant vegetation.

Sustainable Yields and Allocation Limits are not static and may be amended with better knowledge on how aquifers respond to pumping stresses over time.

4 WATER AVAILABILITY

Appendices B and C show the interim Allocation Limits and derivation of the groundwater availability for each aquifer in each subarea in the GGA as of September 2002. The level of licensed allocation, public water supply reserves, applications for allocation and the sum of these is compared to the interim Allocation Limit. This determines the water availability for each subarea. Many Subareas are already fully committed.

Groundwater allocation and availability are dynamic figures. They are updated on a daily basis and can be obtained from the Department’s Swan Goldfields Agricultural Regional Office (refer to Section 10).

The main implications and recommendations for each of the aquifers in the Groundwater Area are as follows:

Surficial and Superficial aquifers

- Applicants requesting a groundwater allocation of more than 25 ML/yr from a single bore from the Surficial aquifer, or 50 ML/yr from a single bore from the Superficial aquifer, will be required to provide the Department with a geophysical bore log in addition to a lithological log to prove that the bore is screened into the unconfined aquifers;
- Due to the large number of wetlands and other environmentally significant features in the area, applicants requesting more than 250 ML/yr from the Superficial aquifer will need first to obtain a licence to explore for water. The licence will allow the applicant to prove the resource can supply the required volume, investigate the potential impacts of the proposed pumping to the environment and other users, and to optimise the pumping regime to limit these impacts;
- Any potential application to take water from the “Barn Road aquifer” within the Surficial aquifer will be assessed on a case by case basis due to potential impact on the environment and existing users;
- At the conclusion of the investigation, the applicant is required to submit a hydrogeological report to the Department, adhering to the Department’s guidelines for such reports (refer to Section 12). The Department will then consider the issuing of a licence to take water if the impacts of the proposed pumping are assessed as acceptable; and
- Of the total Allocation Limit of 241,200 ML/yr in the Superficial aquifer, 49,000 ML/yr has been reserved for future public water supply (Table 3 and Appendices B and C).

Mirrabooka and Poison Hill aquifers

- The Mirrabooka and Poison Hill aquifers have only recently been recognised in the area (Kay and Diamond, 2001), however there is currently insufficient data to determine the full extent of these aquifers and further information is required to improve the estimates of the Allocation Limits;
- The hydraulic connection of the Mirrabooka and Poison Hill aquifers with other aquifers or/and the environment is not well understood;
- Due to the limited data available and to ensure that the impacts of any proposed pumping are acceptable, applicants requesting more than 50 ML/yr from the Mirrabooka and Poison Hill aquifers must first be issued with exploration

licences, provided the risks of not achieving a viable water supply are clearly understood and accepted by the applicant;

- The exploration licences will allow the applicants to investigate the possible impacts of their proposed pumping before the issuing of a production licence can be considered;
- At the conclusion of the investigation, the applicant must submit a hydrogeological report to the Department, adhering to the Department's guidelines for such reports (refer to Section 12);
- Applicants requesting more than 50 ML/yr from these aquifers will be required to submit to the Department a geophysical bore log (carried out by driller/contractor) to prove that the bore is screened into the Mirrabooka and Poison Hill aquifers; and not into the underlying Leederville or Leederville-Parmelia aquifer.

Leederville aquifer

- The Allocation Limit for the Leederville aquifer has been determined with a low degree of confidence due to limited information on the aquifer's hydrogeological characteristics. However, the demand for taking water from this aquifer significantly exceeds the limit. Please refer to Appendix A for the available groundwater for each subarea.
- 6,300 ML/yr of groundwater have been reserved for future public water supply purposes (Table 3 and Appendices B and C).

Leederville-Parmelia aquifer

- The Allocation Limit for the Leederville-Parmelia aquifer has been determined with a low degree of confidence due to limited information on the aquifer's hydrogeological characteristics. However, the demand for taking water from this aquifer in Subarea 5 and 6 significantly exceeds the limit. Please refer to Appendix A for the available groundwater for each subarea.
- Allocation Limit for Subarea 4 has been increased from 6,300 ML/yr to 11,000 ML/yr as a result of re-assessment of the Allocation Limit for Leederville-Parmelia aquifer (Appendix A).
- Allocation Limit for Subarea 5 remains at 8,000 ML/yr.
- Allocation Limit for Subarea 6 remains at 6,300 ML/yr.
- 300 ML/yr of groundwater have been reserved for future public water supply purposes (Table 3 and Appendices B and C).
- Options for reducing allocations in Subarea 6 will be determined through the Water Resources Management Committee process (Please refer to Section 8).

Yarragadee aquifer

- The Allocation Limit for the Yarragadee aquifer has been determined with a low degree of confidence due to limited information on the aquifer's hydrogeological characteristics. However, the demand for taking water from this aquifer significantly exceeds the limit. Please refer to Appendix B for the available groundwater for each subarea.
- 13,900 ML/yr of groundwater have been reserved for future public water supply purposes (Table 3 and Appendices B and C).

Other sedimentary aquifers

- The Cattamarra Coal Measures and Lesueur Sandstone are now considered as aquifers, however they have remained largely unexploited due to their remote location (Figure 3);
- Groundwater in the Lesueur aquifer is believed to be fresh, while groundwater in the Cattamarra aquifer has been found to be brackish.
- 2,000 ML/yr of groundwater in the Lesueur aquifer have been reserved for future public water supply (Table 3 and Appendices B and C).

Fractured rock aquifers

- The bedrock along the eastern boundaries of the GGA contains fractured rock aquifers, which are generally unproductive but can supply small volumes of groundwater in some areas.
- It is important that licensees and potential licensees are aware that reliance on these aquifer systems for a primary source of water poses some risk.
- The Department strongly advises that applicants planning to access these aquifer systems obtain expert advice on aquifer ability to meet their short and long term water requirements

4.1 Climate Change

Climate change is a problem where cause and effect is separated over very long time scales. Climate change may pose a future risk to water supply, but predicting the degree of impact is made difficult by the long response times and large uncertainties. As the scientists grapple with predicting the impacts of climate change on water supply, it is wise for both water managers and water users not to ignore it but to be aware that it may impact on the availability of water in the future.

The Allocation Limits for the subareas in the GGA were calculated on the basis of the current understanding of the prevailing climate conditions. A long-term shift to drier years may impact on the rainfall patterns, which will affect the recharge characteristics and ultimately reduce the availability of water. This in turn could result in a reduction of the Allocation Limits, which may require a corresponding

reduction in water entitlements and water use. On the other hand, a long-term shift to wetter years could have the opposite effect. However, it should be noted that response times to climate change would be greater for confined aquifer systems and corresponding impacts are likely to be less.

Climate change is a whole of community concern and whilst there is no immediate need to incorporate climate change into this Strategy, all water users should be aware that climate change is real and it may impact on the way water is allocated and used in the future. For the purpose of this strategy, climate change and its impact on recharge has not been taken into consideration.

4.2 Risks Associated with the Interim Allocation Limits

Full utilisation of the interim Allocation Limit of the Leederville and Yarragadee aquifers in Subarea 1 is subject to a moderate level of risk. This is because the Allocation Limits were calculated using rainfall recharge over the respective subarea and have not taken into account potential leakage from the overlying Superficial aquifer induced from groundwater abstraction from the confined aquifers because of unreliable data.

Potential high level of utilisation of the Leederville aquifer in Subareas 2 and 3 and the Leederville-Parmelia aquifer in Subareas 4, 5 and 6 would be subject to a higher level of risk. Risk factors include: a low level of hydrogeological knowledge; low level of use and therefore little ability to assess system response to increased stress; and demand in excess of availability. Although there is an acceptable risk associated with the interim Allocation Limits for all confined aquifers, actual water use in all subareas is significantly less than the Allocation Limit and will probably remain so for a number of years. As the utilisation of the aquifers increases, the Allocation Limit will be reviewed and adjusted down if water level and/or water quality decline is deemed to be unsustainable.

4.3 Public Water Supply Held in Reserve

The Department has carried out a preliminary assessment of the quantity of groundwater to be reserved for future public water supply (PWS). The review indicates that there is slightly less water available for PWS because groundwater is limited and brackish in some areas. Table 3 shows the current allocations held in various reserves. These reserves are committed and as such, are included together with licensed allocations when determining the percentage of Allocation Limit that is currently authorised for use (Appendices B and C). These reserves will be reviewed during the preparation of the Sub-regional Groundwater Management Plan.

The PWS reserves are to be used to cater for population growth, or land developments of State significance. The Department is currently assessing the feasibility of temporary utilisation of these reserves for short-term beneficial uses. Such decisions will be made on a case by case basis. As detailed in Statewide Policy No. 6 (refer to Section 12), water service providers or other proponents seeking access to these reserves may be required to purchase or lease these allocations at current market price should the resource become fully allocated and a water trading market is established.

Table 3. Current public water schemes and reserves in the Gingin Groundwater Area

Subarea	Aquifer	Old PWS Reserves (ML/yr)	New PWS Reserves (ML/yr)
Beermullah	Superficial	1,000	3,000
Deepwater Lagoon	Superficial	0	2,000
Guilderton	Superficial	2,000	3,000
Karakin Lakes	Superficial	11,600	6,000
Lake Mungala	Superficial	0	1,000
Lancelin	Superficial	11,600	11,000
North Moore River Park	Superficial		3,000
Seabird	Superficial	11,600	8,000
South Moore River Park	Superficial	2,000	0
Wedge Island	Superficial	11,600	13,000
Subarea 1	Leederville	4,000	5,200
	Yarragadee	9,500	12,500
	Lesueur	0	2,000
Subarea 2	Leederville	2,500	1,100
	Yarragadee	3,000	0
Subarea 3	Leederville	1,600	0
	Yarragadee	0	1,400
Subarea 4	Leederville-Parmelia	10,000	300
Subarea 5	Leederville-Parmelia	7,000	0
Total		89,000	72,500

5 GROUNDWATER LICENSING GUIDELINES

The Gingin Groundwater Area is a Proclaimed Groundwater Area under the *Rights in Water and Irrigation Act (1914)*, and as such, access and use of groundwater is subject to licensing. Consequently, licences are issued under Part III of the *RIWI Act* and in accordance with Department policy which is to licence water use up to sustainable limits only where there is an immediate need and efficient water use can be demonstrated.

The policies and procedures of groundwater licensing in Western Australia are detailed in Appendix D.

6. ALLOCATION PRINCIPLES

The Department's current practice of water allocation is the *first in - first served* (FIFS) approach. This means that the water is generally allocated in order of application. However, there is increasing competition for access to water resources in some subareas of the GGA, which has raised community interest in how water is allocated and whether the FIFS principle is appropriate from an equitable water sharing perspective. The FIFS approach works well where there is a low demand for groundwater and licence applications can be readily assessed as the Department

receives them. However, in subareas where the demand for groundwater is high, or the demand exceeds the Allocation Limit, the FIFS approach to full allocation is considered by the community to be inequitable.

The Department in consultation with the Gingin Water Resources Advisory Committee (GWRAC) have reviewed the methods of allocation for groundwater where demand is approaching the Allocation Limit. The Department in partnership with GWRAC has agreed that a merit selection process will be adopted, which is designed to allocate groundwater above a FIFS threshold, based on economic, social and environmental criteria. On a subarea basis, the Department will assess new applications to take water in accordance with the following procedure:

- a) Groundwater will continue to be allocated on a FIFS basis until the total licensed/committed entitlements reach 90% of the subarea's Allocation Limit.
- b) Once the 90% FIFS threshold has been reached, a mechanism for allocating the remaining 10% of the Allocation Limit has been developed by the Department and GWRAC (refer to 6.1 and Figure 7) and applications will be assessed using a set of merit selection criteria on the following basis:
 - After the 90% threshold has been reached, the Department will continue to assess individual applications for small enterprises up to a maximum of 10 ML/yr per enterprise until 100% of the AL is reached.
 - Applications for allocations greater than 10 ML/yr, but less than 50 ML/yr, will be assessed by the Department following normal licensing assessment procedure and may not require referral to GWRAC.
 - Applications in excess of 50 ML/yr will be assessed by GWRAC using the merit selection process.
 - If the remaining 10% of the Allocation Limit are applied for by only one proponent, the application will be assessed by the Department without the involvement of GWRAC following normal licensing assessment procedures.
 - If the total of applications exceeds the Allocation Limit, regardless of the entitlement, the applications will be assessed by GWRAC using the merit selection process.
 - If the total applications, including the 10 ML/yr applications, do not add up to the remaining 10% of the Allocation Limit at the time of the closing date for applications, normal licence assessment procedures will apply (see procedure a).
 - The merit selection process is applied in situations where the demand exceeds supply.

- c) Once 100% of the Allocation Limit has been allocated, the Department will not issue any further licences to take water. Refinement of the Allocation Limit will be based on the behaviour, via monitoring data, of the groundwater resource as it responds to pumping pressures over time.
- d) Once a subarea is fully allocated, and licences have been refused, any new water becoming available following a licence relinquishment, will be advertised. New applicants and previously refused applicants may apply for this water, under the process defined in Figure 7.
- e) At full allocation, licences for exploration purposes may continue to be issued to allow proving up a water resource in anticipation of obtaining an entitlement through trading.
- f) Once the Allocation Limits are fully committed, groundwater will only become available through trading based local trading rules.
- g) The current policy on metering abstraction states that licensed entitlements of 500 ML/year or more require the installation of flow meters for every production bore. This policy will remain unchanged in the interim, however the Department will review the metering requirement during the tenure of this Strategy as accurate usage is vital to identify unused entitlements for groundwater trading and to ensure usage impacts can be determined.

The Department will inform the community when the following licensed entitlement levels have been reached:

- **70%** of the Allocation Limit -
The Department will place advertisements in newspapers alerting potential groundwater users about the level of allocation in each subarea;
- **90%** of the Allocation Limit -
The Department will re-advertise the level of allocation and call for Expressions of Interest and licence applications for the remaining groundwater allocation in subareas that have reached the 90% threshold (refer to point b). The date of closure of applications will be specified.
- **100%** of the Allocation Limit –
 - The Department will cease to issue any further entitlements to take water; and
 - Licensees may enter the trading market in accordance with the Department’s trading policy and local trading rules.

6.1 The Merit Selection Process

Steps 1 and 2

With reference to Figure 7 and the above, the Merit Selection (MS) process will be implemented when 90% of a subarea’s Allocation Limit has been allocated or when an individual application exceeds the 90% threshold.

Step 3

The Department will advertise in the local newspaper that the 90% threshold has been reached in a particular subarea and call for Expressions of Interest accompanied by licence applications for the remaining groundwater.

Step 4

The Department will send a Merit Selection kit to all parties who register their intent. The kit will contain a licence application and the Merit Selection criteria that must be addressed.

Step 5

Expressions of Interest and licence application forms must be submitted simultaneously. The FIFS principle does not apply once the Merit Selection process is active and all applications will be deemed by the Department to have been received at the same time.

Steps 6, 7 and 8

The Gingin Water Resource Advisory Committee will evaluate, assess and rank each Expression of Interest against the selection criteria contained in the Merit Selection kit.

Step 9

The Department will review the Committee's evaluation, ranking and recommendation(s).

Step 10

A decision will be made by the Department as to which Expression(s) of Interest were successful or unsuccessful.

Step 11

For unsuccessful submissions, the proponent will be advised by the Department that their submission was unsuccessful, the reason why, and that the Department intends to refuse the licence application under the provisions of the Rights in Water and Irrigation Act 1914. Under the terms of the Act, the proponent has the right to appeal the decision.

Step 12

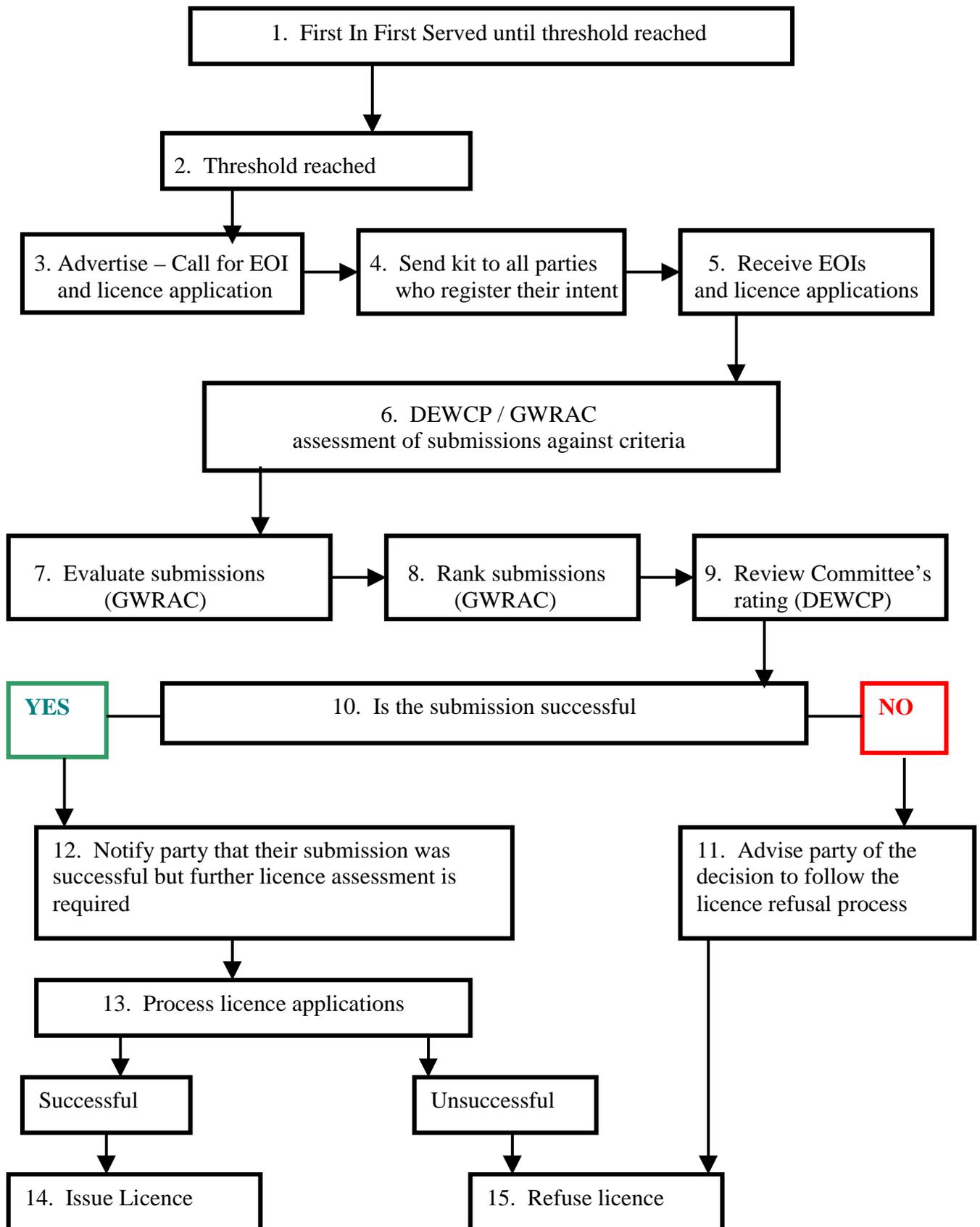
For the successful submissions, the proponents will be advised that their licence application will proceed through the Department's assessment process.

Step 13

The licence application will proceed through normal departmental processes.

Step 14

If the licence application is successful, a licence will be issued with appropriate allocation and conditions.



EIO = Expression of Interest
 DEWCP = Department of Environment, Water and Catchment Protection
 GWRAC = Gingin Water Resources Advisory Committee

FIGURE 7. MECHANISM FOR WATER ALLOCATION

Step 15

If the licence application is unsuccessful, the Department will advise the proponent that it intends to refuse the licence application under the provisions of the *Rights in Water and Irrigation Act 1914*. The proponent then has the right to appeal the decision. The recovered water will be offered to the next application on the list that meets the Merit Selection process.

7 TRADEABLE WATER ENTITLEMENTS (TWEs)

The amended *Rights in Water and Irrigation Act (1914)* enables the implementation of Tradeable Water Entitlements (TWEs) in Western Australia. This enables a licence holder to trade all or part of the licensed entitlement to take water, to another water user.

The Department has developed a statewide policy (refer to Section 12, Statewide Policy No. 6) that provides the framework for how trading can operate.

Trading is a market-based instrument that can be used to:

- Reallocate scarce groundwater resources to uses with higher economic benefit;
- Achieve more efficient use of water resources;
- Allow the water industry to respond to changing conditions; and
- Assist regional development.

Groundwater trading also offers the potential to solve difficult management issues as demand for use of a limited resource increases. It allows new developments access to water in a fully allocated system. The market offers an alternative to ‘command and control’ approaches by allowing a redistribution of water to users of higher economic value and higher efficiency within the bounds of acceptable environmental changes.

TWEs must operate within the water resource management-planning framework, including adequate technical assessment of resource availability community and industry consultation and liaison. TWEs become effective only where licensed allocations have reached the Allocation Limits and when the Department considers impacts of proposed trades acceptable. Groundwater trading in the GGA will be introduced to particular subareas when they become fully allocated. The Department in partnership with the forthcoming Water Resources Management Committee (refer to Section 8) will develop local trading rules.

Information on the rules of trading, applications to trade, technical assessments and notification should be made to Department’s contacts listed in Section 10.

8 PROPOSED WATER RESOURCES MANAGEMENT COMMITTEE

A community-based Water Resources Management Committee will be established in the Gingin-Dandaragan locality that will include the GGA and the Jurien Groundwater Area to the north. This new committee will replace the current Gingin Water Resources Advisory Committee. It is intended that the new Management Committee will be in place in early 2003 and will assist in regularly reviewing the effectiveness of the Interim Allocation Strategy until the Sub-Regional Groundwater Management Plan for the GGA has been developed, with their assistance.

The establishment of this Committee will:

- Provide for and encourage the community to take an active role in the management of water resources through membership and representation on the Committee;
- Assist the Department to determine a fair and equitable water allocation decision and that there is a balance between the community interest and effective management of the resource and any identified dependent ecosystems;
- Have an active role in the allocation planning, licensing and compliance processes;
- Increase community awareness of water resource issues;
- Provide an opportunity for the exchange of views and knowledge between the community and the Department;
- Assist the Department in the resolution of disputes;
- Develop access and use policies that will drive sustainable groundwater development; and
- Advise the Department on water related issues.

9 CONCLUSIONS

The Department is moving towards a groundwater allocation system based on the management of the long-term sustainability of the resource under clearly defined objectives. Paramount in this is a move away from excessive regulatory controls where possible, to more flexible, outcome-focused management. The full participation of the community in the decision-making processes is also an important aspect of this new approach. This will be achieved in a number of ways including the establishment of community-based, local Water Resource Management Committees that will provide the Department with assistance and advice on matters relating to the sustainable management of water resources. The Gingin and Jurien Groundwater Areas are among the first areas in the State where Water Resource Management Committees will be set up.

One important aspect of effective and efficient management of the groundwater resources lies in achieving a sensible balance between competing environmental, social and economic demands. At the same time, the Department must possess a powerful but fair set of regulations which allow a swift and flexible response to problems. Apart from a clear groundwater allocation and management policy, there is a need for a clear licensing and regulatory policy, the will to adhere to the licensing conditions and regulations, and the will to enact the legislation if need be.

The Department is committed to ecologically sustainable development of the Gingin, Jurien and Arrowsmith Groundwater Areas with the provision that reasonable pumping levels are maintained, water quality does not deteriorate below its beneficial uses, equity of access is maintained and there are no adverse environmental impacts. Development of these groundwater areas will therefore be restricted to the Allocation Limit as determined for each subarea. In time, as more technical information becomes available, the Allocation Limits that are presented in this Allocation Strategy will be amended to reflect the additional information. Clearly, a conservative and precautionary approach is the only responsible management strategy that can be adopted, with the recognition and acceptance of the level of risks associated with decision making based on the current level of technical data.

Clearly, groundwater systems with their inherent complexities and variable characteristics are difficult to assess at the best of times. Additionally, groundwater investigations are generally costly and time consuming. These constraints however, should not deter the need for more intensive investigations and the following work should be undertaken in the future:

- Improve present understanding of groundwater recharge processes and quantification;
- Improve the monitoring network;
- Determine ecological water requirements and set environmental water provisions enabling the refinement of Allocation Limits; and
- Extensive consultation with community groups and stakeholders in the area be undertaken to ensure familiarisation of this strategy and constructive input to the Sub-Regional Groundwater Management Plan.

10 CONTACT FOR FURTHER INFORMATION

For further information, including licensing matters, please contact the Department's Regional Office in the first instance:

Swan Goldfields Agricultural Region
Department of Environment, Water and Catchment Protection
7 Ellam Street
VICTORIA PARK WA 6100
Tel: 6250 8000

For technical matters, please contact:

Mr Alex Kern
Senior Water Allocation Officer
Department of Environment, Water and Catchment Protection
3 Plain Street
EAST PERTH WA 6004
Tel: 9278 0399

11 REFERENCES

- Davidson, W.A., 1995; *Hydrogeology and groundwater resources of the Perth Region, Western Australia*: Western Australia Geological Survey, Bulletin 142.
- Kay, T. and Diamond, R., 2001; *A hydrogeological assessment of the Victoria Plains, Red Gully, Gingin Townsite and Eclipse Hill Subareas of the Gingin Groundwater Area*: Water and Rivers Commission, Hydrogeology Report HR 156.
- Kern, A.M., 1993; *The geology and hydrogeology of the superficial formations between Cervantes and Lancelin, Western Australia*: Western Australia Geological Survey, Report 34, Professional Papers, p. 11-36.
- Moncrieff, J.S. 1989; *Hydrogeology of the Gillingarra borehole line, Perth*: Western Australia Geological Survey, Report 26, Professional Papers, p. 105-126.
- Moncrieff, J.S. and Tuckson, M., 1989, *Hydrogeology of the superficial formations between Lancelin and Guilderton, Western Australia*: Western Australia Geological Survey, Report 25, Professional Papers, p. 39-57.
- Water Authority of Western Australia, 1993; *Gingin Groundwater Area Management Plan*: Report No. WG160.
- Water and Rivers Commission, 2000; *Managing the groundwater resources of the Gingin Groundwater Area in the period prior to approval of the revised allocation plan*.
- Water and Rivers Commission, 2001a; *Managing the water resources of the Jurien Groundwater Area – Interim Allocation Strategy (unpublished)*.
- Water and Rivers Commission, 2001b; *Managing the water resources of the Arrowsmith Groundwater Area – Interim Allocation Plan*.
- Yu, X., Davidson, A., and Milligan, N., 2002; *Development of the Perth Region Aquifer Modelling System (PRAMS): in Proceeding of 27th Hydrology and Water Resources Symposium, Melbourne, Victoria, 20-23 May 2002*.

12 SUPPORTING DOCUMENTS

Water and Rivers Commission, 2000; Statewide Policy No. 3 Policy statement on water sharing.

Water and Rivers Commission, 2000; Statewide Policy No. 5 Environmental water provisions policy for Western Australia.

Water and Rivers Commission, 2001; Statewide Policy No. 6 Transferable (Tradeable) Water Entitlements for Western Australia.

Department of Environment, Water and Catchment Protection, in prep.; Confined aquifer policy.

Department of Environment, Water and Catchment Protection, in prep.; Fractured rock aquifer policy.

Department of Environment, Water and Catchment Protection, in prep.; Guidelines for hydrogeological reports.

APPENDIX A

CALCULATION OF ALLOCATION LIMITS

Groundwater allocation limit calculation – Gingin Groundwater Area

Subarea	Aquifer	Area km ²	Rainfall m/yr	Recharge rate (a)	Total gross recharge ML/yr	Proclaimed National Parks and Nature Reserves km ²	Proposed interim EWP based on the area of parks and reserves ML/yr	Proposed interim EWPs based on 20% recharge over subarea ML/yr	Sustainable yield based on recharge less the highest interim EWPs ML/yr	Previous allocation limit (1993) ML/yr	Board approved allocation limit (29/06/01) ML/yr	Net Change ML/yr
Beermullah Plains	Superficial	102.25 116.00	0.70 0.70	15% 6.5%	10,740 5,280	6.27	660	3,200	12,800	16,020	12,800	-3,220
Bindoon	Surficial	64.00	0.60	6.5%	2,500	2.50	100		2,500	170	2,400 (b)	+2,230
Deepwater Lagoon	Superficial	134.30 73.10	0.70 0.70	15% 6.5%	14,100 3,320	65.31	5,320	3,980	12,000	9,580	12,100	+2,520
Eclipse Hill	Surficial	222.60	0.65	6.5%	9,400					780	3,000(b)	+2,220
	Superficial	40.00	0.65	6.5%	1,690	1.53	600	340	1,350	630	1,400	+770
	Mirrabooka Surficial	122.34 205.62	0.65 0.60	3% 6.5%	2,390 8,020					NA 400	500(c) 5,000(b)	+500 +4,600
Gingin Township	Mirrabooka	96.54	0.60	3%	1,740					NA	400(c)	+400
Guilderton	Superficial	20.00 213.53	0.70 0.70	15% 18%	2,100 26,910	16.87	2,120	5,800	23,210	29,010	23,200	-5,810
Karakin Lakes	Superficial	257.00	0.65	18%	30,010	43.01	5,030	6,000	24,010	30,310	24,000	-6,310
Lake Mungala	Superficial	30.00 70.00	0.70 0.70	15% 6.5%	3,150 3,190	1.14	120	1,270	5,070	6,340	5,100	-1,240
	Mirrabooka	51.45	0.70	3%	1,080					NA	200(c)	+200
Lancelin	Superficial	292.90	0.65	18%	34,270	58.54	6,850	6,850	27,420	28,420	27,400	-1,020
Moora	Surficial	114.00	0.55	6.5%	4,080	0.04			4,080	20	800(b)	+780
Namming Lake	Surficial	44.01	0.55	6.5%	1,570					NA	100(b)	+100
	Superficial	176.00 17.40	0.60 0.60	15% 18%	15,840 1,880	53.02	4,770	3,540	12,960	15,320	13,000	-2,320
	Poison Hill	13.45	0.60	6.5%	520					NA	100(d)	+100
North Moore River Park	Superficial	135.70 67.90	0.65 0.65	15% 6.5%	13,230 2,870	83.11	1,620	3,320	12,900	12,140	12,900	+760

Subarea	Aquifer	Area km ²	Rainfall m/yr	Recharge rate (a)	Total gross recharge ML/yr	Proclaimed National Parks and Nature Reserves km ²	Proposed interim EWRs based on the area of parks and reserves ML/yr	Proposed interim EWRs based on 20% recharge over subarea ML/yr	Sustainable yield based on recharge less the highest interim EWRs ML/yr	Previous allocation limit (1993) ML/yr	Board approved allocation limit (29/06/01) ML/yr	Net Change ML/yr
Red Gully	Surficial	813.96	0.60	6.5%	28,550	98.51	3,840		24,710	320	5,600(b)	+5,280
	Superficial	30.72	0.60	6.5%	1,200			240	960	NA	1,000	+1,000
	Mirrabooka	504.5	0.60	3%	9,080					NA	1,800(c)	+1,800
Seabird South Moore River Park	Superficial	249.42	0.65	18%	29,180	60.31	7,060	5,840	22,120	29,180	22,100	-7,080
	Superficial	76.12	0.65	15%	7,420	136.51	13,310	4,150	7,450	11,890	7,500	-4,390
	Superficial	82.17	0.65	18%	9,610							
Victoria Plains	Superficial	88.23	0.65	6.5%	3,730							
	Surficial	693.35	0.55	6.5%	24,790	8.00	2,860		34,210	120	4,400(b)	+4,280
Wedge Island	Poison Hill	503.65	0.55	6.5%	18,010					NA	3,600(d)	+3,600
	Mirrabooka	236.10	0.55	3%	3,900					NA	800(c)	+800
	Surficial	376.20	0.60	6.5%	14,670					NA	3,000(b)	+3,000
Subarea 1	Superficial	655.70	0.60	15%	59,010	177.91	16,010	19,670	78,680	67,030	78,700	+11,670
	Superficial	364.30	0.60	18%	39,340							
	Poison Hill	36.26	0.60	3%	650					NA	100(d)	+100
Subarea 2	Leederville	15.60	0.65	2.5%	250					10,005	6,000(e)	-4,050
	Leederville	46.30	0.65	0.1%	30							
	Leederville	199.44	0.65	0.1%	130					5,850	4,000(g)	-1,850
Subarea 3	Yarragadee	425.95	0.60	2.5%	6,390							
	Yarragadee	368.83	0.60	0.5%	11,060					18,500	16,300(f)	-2,200
	Leederville	426.57	0.60	2.5%	6,400							
Subarea 1	Leederville	25.32	0.60	1%	150							
	Cattamarra	55.45	0.60	1%	330					NA	300	+300
	Lesueur	108.70	0.60	3%	1,960					NA	2,000	+2,000
Subarea 2	Leederville	228.62	0.65	2.5%	3,720							
	Leederville	199.44	0.65	0.1%	130							
	Leederville	192.83	0.65	1%	1,250							
Subarea 3	Leederville	174.06	0.70	2.5%	3,050			860	3,800	7,600	1,600(h)	-6,000
	Leederville	69.93	0.70	2.5%	1,220					4,760	3,400	-1,360
	Leederville	87.28	0.70	0.1%	60							
Subarea 1	Yarragadee	176.99	0.70	1%	1,240					11,700	2,900(i)	-8,800
	Yarragadee	254.54	0.70	1%	1,780							

Subarea	Aquifer	Area km ²	Rainfall m/yr	Recharge rate (a)	Total gross recharge ML/yr	Proclaimed National Parks and Nature Reserves km ²	Proposed interim EWP based on the area of parks and reserves ML/yr	Proposed interim EWPs based on 20% recharge over subarea ML/yr	Sustainable yield based on recharge less the highest interim EWPs ML/yr	Previous allocation limit (1993) ML/yr	Board approved allocation limit (29/06/01) ML/yr	Net Change ML/yr
Subarea 4	Leederville- Parnelia	1380.00								20,270	11,000(j)	-9,270
Subarea 5	Leederville- Parnelia	710.00								13,180	8,000(j)	-5,180
Subarea 6	Leederville- Parnelia	400.00	0.60	1%	180					NA	3,000(k)	+3,000
	Yarragadee	30.58	0.65	1%	270					8,530	6,300(j)	-2,230
Total		40.02	0.65	1%	270					NA	270	+270
										358,620	338,270	-20,350

(a) Recharge rate is based on soil types and considers land clearing.

(b) Interim allocation limit for the surficial aquifer set for management purposes (twice the allocations as at June 2001).

(c) Interim allocation limit for the Mirrabooka aquifer set for management purposes (20% of maximum possible recharge).

(d) Interim allocation limit for the Poison Hill aquifer set for management purposes (20% of maximum possible recharge).

(e) Allocation limit has been decreased to 6,000 ML/yr to account for a low degree of confidence due to limited available data.

(f) Allocation limit has been decreased to 16,300 ML/yr to account for a low degree of confidence due to limited available data.

(g) Allocation limit has been increased to 4,000 ML/yr to account for additional water as throughflow from areas upstream of Subarea 2.

(h) Allocation limit has been increased to 1,600 ML/yr to account for additional water as throughflow from areas upstream of Subarea 2.

(i) Allocation limit has been decreased to 2,900 ML/yr to account for a low degree of confidence due to limited available data.

(j) Calculation based on a percentage of rainfall recharge over the whole aquifer system and allocation limit redistributed on a subarea basis (see details on next page).

(k) Allocation limit has been increased to 3,000 ML/yr to account for additional water as throughflow from areas upstream of Subarea 5.

ALLOCATION LIMITS FOR THE LEEDERVILLE-PARMELIA AQUIFER IN THE NORTHERN PERTH BASIN BASED ON SUBAREA SIZE

The combined Leederville-Parmelia aquifer is mostly confined by thick shales of the Coolyena Group (e.g. Osborne Formation) in the eastern portion of the Gingin, Jurien and Arrowsmith Groundwater Areas. Aquifer recharge occurs mainly in areas where the Coolyena Group is thin or absent (e.g. Subarea 4 and Dinner Hill Subarea). Consequently, the Department has adopted a calculation methodology to set Allocation Limit based on a percentage of rainfall recharge over the whole aquifer system and redistributed on a subarea basis. This principle allows for more equitable distribution of the available resource.

The following figures have been used to calculate the Allocation Limit for each subarea:

- Total area of Leederville-Parmelia aquifer: 4570 km²
(from groundwater divide to north of Perth region)
- Total recharge of the system: 40,500 ML/year
- Interim EWP set at 10% of recharge: 4,000 M/L year
- Total sustainable yield: 36,500 ML/year
- Allocation/area: 36,500 ML/year / 4570 km² = 8 ML/year/km² or
8 000 KL/year/km²

Subarea	Area Km ²	Derived allocation limit ML/year	Board- approved interim allocation limit ML/year	Remarks
Morrison (Arrowsmith GWA)	500	4,000	4,000	Most area covered by uncleared Crown Land and National Park
Dinner Hill (Jurien GWA)	1580	12,600	12,600	More water is available for allocation than by calculation using local rainfall recharge
Subarea 4 (Gingin GWA) (Victoria Plain + eastern margin of Wedge Island)	1380	11,000	11,000	More water is available for allocation
Subarea 5 (Gingin GWA) (Red Gully)	710	5,700	8,000	Previous Allocation Limit still valid because of extensive monitoring
Subarea 6 (Gingin GWA) (Gingin Townsite + Eclipse Hill)	400	3,200	6,300	Previous Allocation Limit still valid because of extensive monitoring
Total	4570	36,500	41,900	

APPENDIX B

ALLOCATIONS AND GROUNDWATER AVAILABILITY

PER SUBAREA

IN THE GINGIN GROUNDWATER AREA

EXPLANATORY NOTES FOR APPENDICES B AND C

The current status of groundwater allocation in each aquifer system present in each Subarea is shown in the attached tables. The following is an explanation of the tables.

Sustainable Allocation Limit

The Allocation Limit refers to the maximum volume of groundwater that is licensed for consumptive use on an annual basis. It represents the annual pumping volume that can be sustained in the long term. Inherent in the Allocation Limit is the provision for the environment (refer to Section 3).

Total Licensed Allocation

The licensed allocation can also be referred to as the licensed entitlement. This is the total volume of groundwater that is authorised for consumptive use under groundwater licences. The maximum licensed allocation cannot exceed the Allocation Limit.

% of Limit (1)

This refers to the total licensed allocation as a percentage of the Allocation Limit. It cannot exceed 100% although under some circumstances, the Department may determine that the total licensed allocation should not exceed a percentage less than 100%.

Allocation held in Reserve

The Department may determine that a certain volume of groundwater should be reserved in the interest of future public water supply purposes. As such, this volume will be considered as being committed (refer to Section 3.3).

Sum of Total Licensed Allocation + Allocation held in Reserve

The sum of the licensed allocation + reserve allocation.

% of Limit (2)

This refers to the sum of the licensed + reserve allocation as a percentage of the Allocation Limit. It cannot exceed 100%. If the percentage is less than 100%, then licence applications may be considered. If the percentage is 100%, then licence applications will not be considered.

New Licence Applications

This shows the total volume of groundwater under application for groundwater licences.

Sum of Total Licensed Allocation + Allocation held in Reserve + new applications

The sum of the licensed allocation + reserve allocation + applications.

% of Limit (3)

The sum of the licensed allocation + reserve allocation + applications should not exceed 100% of the Allocation Limit. If the addition of the licence applications exceeds 100% of the limit, then not all applications will be approved.

Balance Available for Licensing

If the sum of Total Licensed Allocation + Allocation held in Reserve + new applications is less than the Sustainable Allocation Limit, all applications will be considered but not all of them will be approved and there will be a balance of unallocated groundwater available.

If the sum of Total Licensed Allocation + Allocation held in Reserve + new applications is more than the Sustainable Allocation Limit, then not all applications will be approved.

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea

BEERMULLAH PLAIN SUBAREA			(Current to September 2002)							
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	12,800	5,063	40	3,000	8,063	63	604	8,667	68	4,133
TOTAL	12,800	5,063		3,000	8,063		604	8,667		4,133
BINDOON SUBAREA			(Current to September 2002)							
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Surficial	2,400	1,657	69	0	1,657	69	205	1,862	78	538
TOTAL	2,400	1,657		0	1,657		205	1,862		538
DEEPWATER LAGOON SUBAREA			(Current to September 2002)							
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	12,100	3,119	26	2,000	5,119	42	2,609	7,728	64	4,372
TOTAL	12,100	3,119		2,000	5,119		2,609	7,728		4,372
ECLIPSE HILL SUBAREA			(Current to September 2002)							
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	1,400	34	2	0	34	2	199	233	17	1,167
Surficial	3,000	1,547	52	0	1,547	52	416	1,963	65	1,037
Poison Hill	Unknown	0		0	0		0	0		Unknown
Mirraboopa	500	1,449	290	0	1,449	290	0	1,449	290	0
TOTAL	4,900	3,030		0	3,030		615	3,645		2,204

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea

GINGIN TOWNSITE SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	0	0		0	0		0	0		0
Surficial	5,000	2,763	55	0	2,763	55	691	3,454	69	1,546
Poison Hill	Unknown	0		0	0		0	0		Unknown
Mirrabooka	400	194	49	0	194	49	365	559	140	0
TOTAL	5,400	2,957		0	2,957		1,056	4,013		1,546
GUILDERTON SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	23,200	13,250	57	3,000	16,250	70	5,655	21,905	94	1,295
TOTAL	23,200	13,250		3,000	16,250		5,655	21,905		1,295
KARAKIN LAKES SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	24,000	1,670	7	6,000	7,670	32	11,474	19,144	80	4,856
TOTAL	24,000	1,670		6,000	7,670		11,474	19,144		4,856
LAKE MUNGALA SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	5,100	2,039	40	1,000	3,039	60	138	3,177	62	1,923
Mirrabooka	200	0		0	0		0	0	0	200
TOTAL	5,300	2,039		1,000	3,039		138	3,177		2,123

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea

LANCELIN SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	27,400	12,659	46	11,000	23,659	86	4,551	28,210	103	0
TOTAL	27,400	12,659		11,000	23,659		4,551	28,210		0
MOORA SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Surficial	800	104	13	0	104	13	0	104	13	696
TOTAL	800	104		0	104		0	104		696
NAMMING LAKE SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	13,000	83	1	0	83	1	1,500	1,583	12	11,417
Surficial	300	0	0	0	0	0	0	0	0	300
Poison Hill	100	0	0	0	0	0	0	0	0	100
TOTAL	13,400	83		0	83		1,500	1,583		11,817
NORTH MOORE RIVER PARK SUBAREA		(Current to September 2002)								
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Superficial	12,900	6,018	47	3,000	9,018	70	3,720	12,738	99	162
TOTAL	12,900	6,018		3,000	9,018		3,720	12,738		162

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea

RED GULLY SUBAREA		(Current to September 2002)									
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Superficial	1,000	453	45	0	453	45	546	999	100	0	
Surficial	5,600	793	14	0	793	14	1,333	2,126	38	3,474	
Poison Hill	Unknown	0		0	0	0	0	0		Unknown	
Mirrabooka	1,800	623	35	0	623	35	1,100	1,723	96	77	
TOTAL	8,400	1,869		0	1,869		2,979	4,848		3,551	
SEABIRD SUBAREA		(Current to September 2002)									
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Superficial	22,100	10,593	48	8,000	18,593	84	3,279	21,872	99	228	
TOTAL	22,100	10,593		8,000	18,593		3,279	21,872		228	
SOUTH MOORE RIVER PARK SUBAREA		(Current to September 2002)									
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Superficial	7,500	1,899	25	0	1,899	25	4,372	6,271	84	1,229	
TOTAL	7,500	1,899		0	1,899		4,372	6,271		1,229	
VICTORIA PLAINS SUBAREA		(Current to September 2002)									
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Surficial	4,400	1,829	42	0	1,829	42	800	2,629	60	1,771	
Poison Hill	3,600	0		0	0	0	0	0		3,600	
Mirrabooka	800	0		0	0	0	0	0		800	
TOTAL	8,800	1,829		0	1,829		800	2,629		6,171	

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea

WEDGE ISLAND SUBAREA				(Current to September 2002)				(Current to September 2002)			
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Superficial	78,700	7,851	10	13,000	20,851	26	16,100	36,951	47	41,749	
Surficial	3,000	155	5	0	155	5	0	155	5	2,845	
Poison Hill	100	0	0	0	0	0	0	0	0	100	
TOTAL	81,800	8,006		13,000	21,006		16,100	37,106		44,694	
SUBAREA 1											
(Current to September 2002)											
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Leederville	6,000	45	1	5,200	5,245	87	876	6,121	102	0	
Yarragadee	16,300	3,882	24	12,500	16,382	101	0	16,382	101	0	
Cattamarra	300	0	0	0	0	0	0	0	0	300	
Lesueur	2,000	0	0	2,000	2,000	0	0	2,000	100	0	
TOTAL	24,600	3,927		19,700	23,627		876	24,503		300	
SUBAREA 2											
(Current to September 2002)											
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Leederville	4,000	3,155	79	1,100	4,255	106	1,800	6,055	151	0	
Yarragadee	1,600	0	0	0	0	0	800	800	50	800	
TOTAL	5,600	3,155		1,100	4,255		2,600	6,855		800	
SUBAREA 3											
(Current to September 2002)											
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year	
Leederville	3,400	3,340	98	0	3,340	98	0	3,340	98	60	
Yarragadee	2,900	0	0	1,400	1,400	48	1,500	2,900	100	0	
TOTAL	6,300	3,340		1,400	4,740		1,500	6,240		60	

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per subarea										
SUBAREA 4										
(Current to September 2002)										
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Leederville-Parmelia	11,000	4,910	45	300	5,210	47	5,781	10,991	100	0
Yarragadee	Unknown	0		0	0		0	0		Unknown
Fractured rock	Unknown	0		0	0		0	0		Unknown
TOTAL	11,000	4,910		300	5,210		5,781	10,991		0
SUBAREA 5										
(Current to September 2002)										
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Leederville-Parmelia	8,000	6,489	81	0	6,489	81	588	7,077	88	923
Yarragadee	3,000	2,000	67	0	2,000	67	1,125	3,125	104	0
Fractured rock	Unknown	0		0	0		0	0		Unknown
TOTAL	11,000	8,489		0	8,489		1,713	10,202		923
SUBAREA 6										
(Current to September 2002)										
Aquifer	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Leederville-Parmelia	6,300	8,064	128	0	8,064	128	325	8,389	133	0
Yarragadee	270	0		0	0		0	0		270
Fractured rock	Unknown	0		0	0		0	0		Unknown
TOTAL	6,570	8,064		0	8,064		325	8,389		270

APPENDIX C

ALLOCATIONS AND GROUNDWATER AVAILABILITY

PER AQUIFER

IN THE GINGIN GROUNDWATER AREA

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per aquifer										
POISON HILL AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Eclipse Hill	Unknown	0		0	0	0	0	0		Unknown
Gingin Townsite	Unknown	0		0	0	0	0	0		Unknown
Namming Lake	100	0		0	0	0	0	0		100
Red Gully	Unknown	0		0	0	0	0	0		Unknown
Victoria Plains	3,600	0		0	0	0	0	0		3,600
Wedge Island	100	0		0	0	0	0	0		100
TOTAL	3,800	0		0	0	0	0	0		3,800
MIRRABOOKA AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Eclipse Hill	500	1,449	290	0	1,449	290	0	1,449	290	0
Gingin Townsite	400	194	49	0	194	49	365	559	140	0
Lake Mungala	200	0		0	0	0	0	0		200
Red Gully	1,800	623	35	0	623	35	1,100	1,723	96	77
Victoria Plains	800	0		0	0	0	0	0		800
TOTAL	3,700	2,266		0	2,266		1,465	3,731		1,077
PERTH - LEEDERVILLE AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 1	6,000	45	1	5,200	5,245	87	876	6,121	102	0
Subarea 2	4,000	3,155	79	1,100	4,255	106	1,800	6,055	151	0
Subarea 3	3,400	3,340	98	0	3,340	98	0	3,340	98	60
TOTAL	13,400	6,540		6,300	12,840		2,676	15,516		60

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per aquifer										
LEEDERVILLE - PARMELIA AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 4	11,000	4,910	45	300	5,210	47	5,781	10,991	100	0
Subarea 5	8,000	6,489	81	0	6,489	81	588	7,077	88	923
Subarea 6	6,300	8,064	128	0	8,064	128	325	8,389	133	0
TOTAL	25,300	19,463		300	19,763		6,694	26,457		923
YARRAGADEE AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 1	16,300	3,882	24	12,500	16,382	101	0	16,382	101	0
Subarea 2	1,600	0	0	0	0	0	800	800	50	800
Subarea 3	2,900	0	0	1,400	1,400	48	1,500	2,900	100	0
Subarea 4	Unknown	0	0	0	0	0	0	0	0	Unknown
Subarea 5	3,000	2,000	67	0	2,000	67	1,125	3,125	104	0
Subarea 6	270	0	0	0	0	0	0	0	0	270
TOTAL	24,070	5,882		13,900	19,782		3,425	23,207		1,070
CATTAMARRA AQUIFER										
(Current to September 2002)										
Subarea	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 1	300	0	0	0	0	0	0	0	0	300
TOTAL	300	0		0	0		0	0		300

GINGIN GROUNDWATER AREA - Allocations and groundwater availability per aquifer										
LESUEUR AQUIFER										
(Current to September 2002)										
	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 1	2,000	0		2,000	2,000	100	0	2,000	100	0
TOTAL	2,000	0		0	2,000		0	2,000		0
FRACTURED ROCK AQUIFER										
(Current to September 2002)										
	Sustainable Limit ML/year	Licensed Allocation ML/year	% of Limit (1)	Reserved Allocation ML/year	Licensed + Reserved Allocation ML/year	% of Limit (2)	New Applications ML/year	Licensed + Reserved + New Applications ML/year	% of Limit (3)	Balance available for licensing ML/year
Subarea 4	Unknown	0		0	0		0	0		Unknown
Subarea 5	Unknown	0		0	0		0	0		Unknown
Subarea 6	Unknown	0		0	0		0	0		Unknown
TOTAL	0	0		0	0		0	0		0

APPENDIX D

GROUNDWATER LICENSING GUIDELINES

GROUNDWATER LICENSING GUIDELINES

The guidelines for dealing with either current licensees or applicants requesting access to the groundwater resources in the GGA are outlined below. These guidelines apply to all aquifers and will remain current until the Groundwater Management Plan is finalised, or until changes to the guidelines are authorised by the Department.

Further information on licensing and other aspects of the Act can be obtained by accessing the information pamphlets (Appendix D) from the regional office in Perth.

1 Existing Licences

If a licensee is not utilising all of the authorised allocation in accordance with the approved development, the licensee will be asked to explain why the allocation should not be reduced to better reflect current use and near future requirements. Licensees may be required to collect monthly water usage figures and provide them to the Department on an annual basis.

The Swan Goldfields Agricultural Region will also conduct random surveys of use in fully allocated subareas. Random surveys of use for the remaining subareas may be undertaken at a later time as these subareas have approached the interim Allocation Limits.

The Department will act to reduce unused portions of licensed allocations when there is no clear establishment that extenuating circumstances have resulted in part of the entitlement not being used. The ‘use it or lose it’ rule will be strictly adhered to, to ensure unused allocations do not hinder ecologically sustainable development

2 Existing Licences for Exploration Purposes

Exploration licences had been issued to some applicants in the past for a period of up to two years. This has allowed the applicant to investigate whether there is sufficient water available to meet the desired requirements of the development plan and to determine the likely impacts caused by pumping.

- In some cases, applicants have been informed that the Department gives no guarantee that a licence to take water will be issued at the completion of the investigation. **This position is reiterated and reinforced here.** Applicants should also be aware of the new interim Allocation Limits and the water availability in their Subarea (as shown in Appendices B and C) before embarking on an exploration program. Updated information is available from the Swan Goldfields Agricultural Regional office in Perth.
- Holders of current licences for exploration purposes, who have not started any exploration work, are advised that the Allocation Limits in some subareas are interim only and under review. A reduction in the Allocation Limit may impact on the likelihood of obtaining a licence to take water or for the quantity sought, particularly for those exploring for water in the Leederville-Parmelia aquifer system in subareas that are close to full allocation.

- Licence holders are further advised that it is likely that applications for a licence to take water in these subareas and aquifer systems may be refused, even if the drilling program has confirmed the presence of sufficient groundwater to meet their needs.
- Licence holders of expired licences for exploration purposes who have not undertaken any exploration work, are hereby informed that their expired licence will not be renewed. This will generally not be a problem in under-allocated subareas as a new exploration licence may be issued for a term defined by the Department (generally no longer than 12 months). However, the Department advises that holders of expired licences for exploration purposes in fully allocated subareas or areas where demand already exceeds supply should not undertake any drilling work or other activity as it is unlikely that licences for taking water will be issued.

3 Applications for New Licences for Exploration Purposes

- The Department may issue a groundwater exploration licence for a period of 12 months, or as otherwise determined by the Department, in subareas where the interim Allocation Limit is not fully committed (refer to Appendices B and C).
- The Department will continue to issue groundwater licences for exploration purposes in subareas where the interim Allocation Limit is fully committed only in cases to allow the assessment of the aquifer performance for the purpose of future groundwater trading (refer to Section 6).
- Where a new exploration licence issued and sufficient water is available to satisfy the proposed development, an allocation of water will be held in reserve until completion of exploratory drilling and approval by the Department of a submitted hydrogeological report. This report must demonstrate the likely impacts caused by pumping to ensure sustainability and no detrimental impacts to any environmental features and neighbouring users.
- Licences for exploration purposes do not guarantee that a licence to take water will be forthcoming or indicate what quantity of water will be available under any subsequent licence.

4 Pending Licence Applications

Currently there are many licence applications to take water under consideration with no commitments from the Department. These applications will be assessed using the interim Allocation Limits in this document.

5 New Licence Applications

- New applicants should be aware of the interim Allocation Limits and the on-going review. New applications will be assessed using the new interim Allocation Limits. Applications for licences to take water in subareas that are fully allocated will be refused.

- New applications will be generally considered on a *first in - first served* basis (refer to Section 5). This is the current Department practice. Where sufficient water is available to meet the applicant's requirements, a licence may be issued after the applicant has met all the Department's conditions.

6 Renewal of Existing Licences

- Groundwater licences to take water are valuable documents that should be kept in a safe place and not allowed to expire.
- It is the licence holder's responsibility to make an application to extend the term of the existing licence prior to the expiry date.

Generally, when a licence to take water expires in an under-allocated subarea and the licensee has abided by all the licence conditions, the licence will normally be extended for a further period. However, if a licence to take water expires in a fully-allocated subarea, and the licensee has abided by all the licence conditions, there is no guarantee that the term of the licence will be automatically extended and the licensee may need to show cause why the term of the licence in its entirety should be extended. If a licensee has not abided by all the licence conditions in a fully-allocated Subarea, the licence is unlikely to be extended.

In addition, if at the time of renewal application, licensees are using less water for the approved purpose than the licensed allocation, the licensee will be asked to show cause why the allocation should not be reduced to better reflect the amount of water actually being used.

7 Applications for Increasing an Existing Allocation

An application to increase a licensed allocation will be treated as new application for additional water requested.

8 Advertising Licence Applications

An applicant is required to advertise any new and additional application to take water in excess of 100ML/yr in a newspaper circulating daily in the State and in the local media.

9 Development Plans and Monitoring Conditions

Applications for large allocations must be accompanied by a detailed development plan and timetable that clearly stipulates their required water need for each stage of the development. Should the total requested water be available, the Department may gradually increase the allocation to satisfy the water needs in accordance with the agreed development timetable. If the proposed development does not take place or is delayed, the licensee should show cause why the allocation should be renewed for the following years or stages. In the event that less water is required for the development than originally anticipated, or there is adverse impact on other users or the environment, the licence allocation may be reduced.

Conditions can be applied to licenses to monitor and report on aquifer performance in response to groundwater abstraction. Some key performance indicators can include the routine measurement of groundwater levels and salinity. Monitoring is not necessarily restricted to the development area, but where required, the Department can also request off-site monitoring of impacts. This information is used in conjunction with the Department's regional water monitoring program to ensure protection of neighbouring groundwater users, minimise environmental degradation and maintain the long term sustainability of the aquifer system.

10 Domestic and Stock Water

Domestic and stock water demand is given a high priority in areas where no reticulated water supply exists.

Domestic and stock bores are exempt from licensing under the RIWI Act if the bore supplies water for domestic and stock purposes only, and the water is drawn from the Superficial or Surficial aquifer. Bores that will draw from confined aquifers in the groundwater area require a licence (under section 26D of the Act) to construct the bore, and a licence (under section 5C of the Act) to abstract water.

The Department is currently preparing by-laws under the RIWI Act to manage domestic and stock water bores. These by-laws will result in some changes to the current arrangements, and are expected to be gazetted before the November 2002. Please contact the Department for more information.

It is estimated that less than 1% of any particular Allocation Limit is used for domestic and stock water supply in the Gingin Groundwater Area. As such no reserve has been made.

APPENDIX E

INFORMATION PAMPHLETS AVAILABLE FROM THE DEPARTMENT OF ENVIRONMENT, WATER AND CATCHMENT PROTECTION

- Building a dam
- Changes to the Rights in Water and Irrigation Act 1914
- Civil remedy
- Community participation and the *Rights in Water and irrigation Act 1914*
- Directions to water users
- How can I appeal against a decision of the Department?
- How can I use the register to find out who can take water?
- I am buying a property - How can I get a water licence?
- I am selling my property – What can I do with my water licence?
- I want to change or extend my water licence?
- Rights to take water in licensed areas
- Rights to water in unlicensed areas
- Transferring water licences and entitlements
- What are my obligations as a licence holder?
- What are well licences and permits and how can I apply for them?
- What is a water licence and how can I apply for one?