



Government of **Western Australia**
Department of **Water**

Gingin groundwater allocation plan

For public comment

August 2013

Looking after all our water needs

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For public comment

Looking after all our water needs

Department of Water

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Department of Water
168 St Georges Terrace
Perth Western Australia 6000
Telephone +61 8 6364 7600
Facsimile +61 8 6364 7601
National Relay Service 13 36 77
www.water.wa.gov.au

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Project team: Melissa Gaikhorst, Leanne Hartley, Alex Kern, Mike Kelly, Anya Lam, Fiona Lynn, Andrew Paton, Rod Short, Moe Tiong, Andrew Tuffs, Kerrie Youngs.

Project board: John Connolly, Don Cummins, Sandie McHugh, Susan Worley.

Project assurance: Matthew Awang

For more information about this report, contact:

Don Cummins (Regional Manager) at the Swan–Avon regional office

Department of Water

7 Ellam Street, Victoria Park, Western Australia 6100

Telephone (08) 6250 8000

Facsimile (08) 6250 8050

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Message from the Director General

Easily accessible, good quality groundwater is essential to industries in the Gingin plan area. It is also essential that water is available to maintain the groundwater-dependent environment. Demands on the resource are becoming greater and are projected to increase further as Perth expands northwards. At the same time, the amount of rainfall and groundwater recharge is likely to reduce as the drying trend in the south-west of Western Australia continues.

The *Gingin groundwater allocation plan: for public comment* explains how the Department of Water will maintain a reliable groundwater supply for agriculture, horticulture, industry, urban development and the environment. This plan describes our approach to reducing risks to future groundwater supply and the environment by applying updated allocation limits and local licensing rules.

The allocation limits set out in this plan account for reduced rainfall due to the drying climate trend, current and projected water use, groundwater-dependent ecosystems, flows in Gingin Brook and Moore River and the location of the seawater interface in the coastal aquifers. These considerations will help reduce risks to the security and reliability of supply for current and future water users.

Your input to this plan is important. We consider all of the submissions we receive in finalising our plan. We invite you to make a submission.



Maree De Lacey

Director General, Department of Water

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Summary

The Department of Water is responsible for allocating and licensing the state's water resources.

It has been ten years since the release of *Managing the water resources of the Gingin groundwater area, WA—interim sub-regional allocation strategy* (WRC 2002). The *Gingin groundwater allocation plan: for public comment* replaces this strategy and sets out how the department will continue to allocate and license groundwater in the Gingin plan area.

The updated allocation limits and our approach to allocating and licensing will support licensees by maintaining reliable groundwater resources. This plan will help to protect groundwater-dependent ecosystems and watercourses within the plan area. The plan also supports development in the area by indicating the amount of water that can reliably be abstracted and by establishing new water trading zones.

The department prepared the *Gingin groundwater allocation plan: for public comment* with help from stakeholders in the Gingin area and using feedback from public information sessions.

Purpose of the plan

Reduced rainfall and lower groundwater recharge has resulted in declining groundwater levels in many aquifers and is contributing to declining baseflow in the Gingin Brook and Moore River. The allocation limits and the licensing rules in the plan are designed to maintain the reliability of current groundwater entitlements and reduce the risks to the groundwater-dependent environment from abstraction.

Water availability in the Gingin plan area

Water is still available for licensing in 16 out of the 25 subareas in the Gingin plan area. The allocation limits summarise water availability for all aquifers in each subarea.

Subarea	Allocation limit (ML/yr)	Water available*
Beermullah Plain North	6 500	No
Bindoon	2 400	Yes
Eclipse Hill	4 050	Yes
Gingin Townsite	5 920	Yes
Guilderton North	6 500	No
Karakin Lakes	17 000	Yes
Lancelin	21 000	No
Moora	800	Yes
Namming Lake	10 800	Yes
North Moore River Park	12 900	Yes
Red Gully	6 350	Yes
Seabird	17 000	No
South Moore River Park	7 500	Yes
Victoria Plains	4 400	Yes
Wedge Island	61 500	Yes
Central Coastal	2 800	No
Northern Coastal	6 050	No
Southern Coastal	1 000	Yes
Central Scarp	1 550	Yes
Northern Scarp	3 750	Yes
Southern Scarp	850	No
Cowalla	19 000	No
Cataby	13 000	Yes
Wannamal	1 300	No
Chandala	850	Yes
Total	234 770	

**Water availability for licensing may change from time to time. Please contact our Swan–Avon regional office for up-to-date information on the volume of water available for use.*

Allocation and licensing approach for the Gingin plan area

The department will issue licences up to the allocation limits using the licensing rules set out in Chapter 4. Once allocation limits are reached, water users may be able to access additional groundwater through trading. The plan establishes three trading zones in the Leederville–Parmelia subarea. To prevent further groundwater declines, trades within the Leederville–Parmelia that reduce abstraction from the southern zone are preferred.

The department has also reserved water for future regional water supply needs, and as an option for future Perth needs. This reserve may be accessed for other purposes on a non-renewable temporary basis.

The department may require applicants seeking to take groundwater from the Mirrabooka aquifer to submit additional hydrogeological information, including lithology and bore logs. This information will be used to assess whether the proposed abstraction is likely to reduce the baseflow in the Gingin Brook and Moore River.

Where resources are over-allocated, the department will recoup unused water entitlements. We will not re-allocate recouped entitlements in over-allocated subareas.

Have your say

This plan is now released for public comment. Our public comment period is open until 6 December 2013.

We will review and consider each of the comments we receive in finalising the *Gingin groundwater allocation plan*. We will release a statement of response alongside the final plan, which summarises each of the comments received and how we considered them in the final plan.

People and organisations will not be individually identified, but we may quote directly from your comments, so please state clearly if you do not wish us to do so.

Please send your comments by 5.00 pm 6 December 2013 to:

allocation.planning@water.wa.gov.au

or to the address below:

Branch Manager
Water Allocation Planning Branch
Department of Water
PO Box K822
PERTH WA 6842

1 Plan purpose and scope

1.1 Purpose of the plan

The *Gingin groundwater allocation plan: for public comment* is the Department of Water's response to the drying climate and high abstraction of the water resources in the Gingin groundwater area. The plan has been developed to reduce the likelihood of:

- decreasing reliability of current licensed entitlements
- further declines in groundwater levels and pressure heads
- decreasing groundwater contribution (baseflow) to Gingin Brook and Moore River
- damage to and loss of important groundwater-dependent ecosystems
- the seawater interface moving inland, making groundwater saline.

The department will manage these risks by using the allocation limits, licensing rules and the monitoring program established in this plan. The allocation limits in this plan replace those established in 2002 in the interim sub-regional allocation strategy - *Managing the water resources of the Gingin groundwater area, WA—interim sub-regional allocation strategy* (WRC 2002).

This new plan also helps current and future licensees in the area by defining the volume of water that can reliably be abstracted, updating the amount of water reserved for public supply and introducing new water trading zones where water availability is currently limited.

The plan is accompanied by the *Gingin groundwater allocation plan methods report* (DoW 2013), which describes the data and approach we used when making allocation decisions for this plan.

For information on the department's approach for managing Gingin Brook's surface water resources, refer to *Gingin surface water allocation plan* (DoW 2011a).

Changes and new information since the 2002 interim strategy

Like all of the south west of the state, the plan area is being affected by a drying climate trend. In the southern portion of the plan area, mean annual rainfall has dropped by 15 per cent, to 618 mm/yr, from the long-term mean of 727 mm/yr.

Data from the department's monitoring bores have shown that the aquifers in the plan area are responding differently depending on the amount of recharge they are receiving and the amount of groundwater that is being abstracted. Groundwater levels in the superficial aquifer in the Wedge Island subarea have declined by up to 4 m since 1997. In other subareas the groundwater levels in the superficial aquifer are relatively stable. In parts of the north east of the plan area levels have increased by up to 2m.

Pressure heads in the southern portion of the deeper Yarragadee and Leederville–Parmelia aquifers have declined more than 4 m since 1997.

Currently, agricultural and horticultural industries are the main groundwater uses in the plan area, accounting for about 85 per cent of licensed entitlements. Since the 2002 interim strategy was released, licensed water entitlements have increased by 35 GL/yr (from 106 to 141 GL/yr).

The department's recent investigations have confirmed that groundwater discharge provides baseflow to the Gingin Brook from the Superficial, Mirrabooka, Leederville and Leederville–Parmelia aquifers. Groundwater declines in these aquifers are likely to have contributed to reduced flows in the Gingin Brook, by reducing baseflow from these aquifers.

The department is currently installing bores to investigate the potential for the coastal aquifers (particularly the Leederville and Yarragadee aquifers) to become saline from the inland movement of the seawater interface.

1.2 Plan area

This plan area covers most of the Gingin proclaimed groundwater area (Figure 1). The town of Gingin is close to the southern boundary of the plan area and is approximately 90 km north of Perth. The plan area covers about 6000 km² and extends between Guilderton and Bindoon in the south, to Grey and Moora in the north. The southern boundary of the plan area generally follows the Gingin Brook and Moore River. Subareas south of Gingin Brook and Moore River are now part of the *Gnangara groundwater areas allocation plan* (DoW 2009a). The Gingin groundwater area was proclaimed on 26 September 1975 under section 26B of the *Rights in Water and Irrigation Act 1914*. This means that water users require a water licence to lawfully abstract groundwater under section 5C of the Act, unless exemptions apply.

The majority of the land use in the Gingin plan area is associated with irrigated agriculture and horticulture. However, there are also large areas of nature reserve and national park, particularly west of the Brand Highway and along the Indian Ocean Drive (Figure 1). These range from 2 km² in the Moora subarea (2 per cent of subarea) 175 km² in the South Moore River Park subarea (71 per cent of subarea).

The Gingin plan area contains groundwater-dependent ecosystems that are at risk from declining groundwater levels. These include swamps, wetlands, areas of native vegetation and ecological systems that depend on river baseflow. These are:

- located on the Swan coastal plain where the superficial aquifer is present (west of the Gingin Scarp)
- connected to parts of the Leederville–Parmelia aquifer, particularly along the Dandaragan Scarp (especially Moore River near Mogumber, as well as Gingin and Lennard Brooks)
- connected to some parts of the Mirrabooka aquifers.

Guraga Lake, Karakin Lakes, Wannamal Lake system, Chandala Swamp and Chittering–Needonga Lakes are recognised wetlands listed in the *Directory of important wetlands in Australia* (ANCA 1996) (Figure 6 in Section 3.3). There are also other ecosystems recognised under the Environmental Protection Authority’s Environmental Protection Policy and large areas of well preserved native bushland along the Swan Coastal Plain within several national parks.

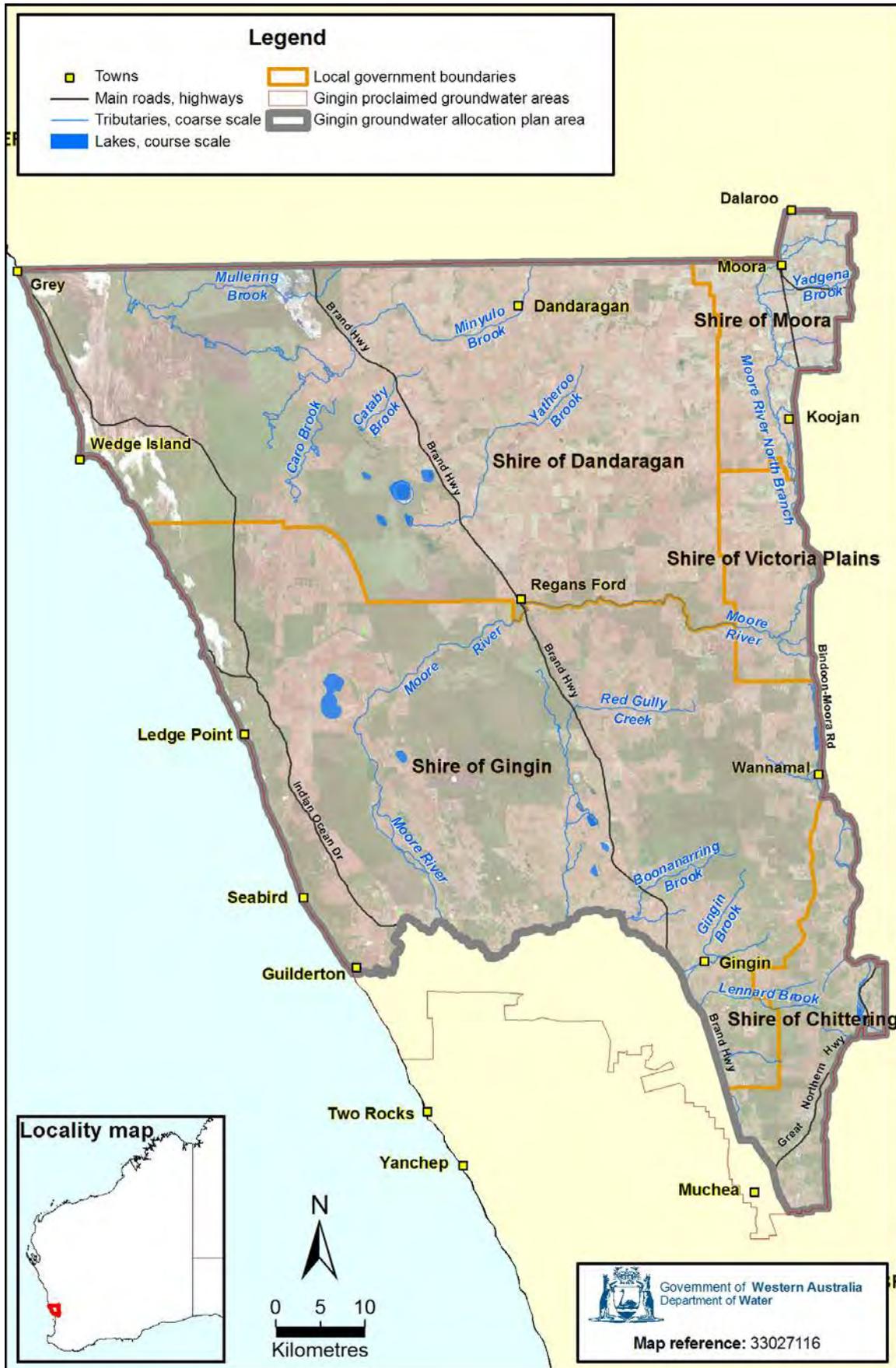


Figure 1 Gingin groundwater allocation plan area

1.3 Water resources covered

This plan applies to nine aquifer types present in the plan area. The characteristics and location of these aquifers are listed in Table 1.

Table 1 Aquifers within the Gingin groundwater plan area

Aquifer	Description and notes	Location
Surficial	<ul style="list-style-type: none"> • Extensive, patchy aquifer (sand, clay) • Unconfined, thin and often unsaturated • Generally fresh groundwater (<1000 mg/L TDS) • Generally small bore yields (<100 kL/day) • Supports groundwater-dependent ecosystems 	East of the Brand Highway– Figure 2
Superficial	<ul style="list-style-type: none"> • Extensive and shallow aquifer (sand, gravel, clay) • Unconfined with saturated thickness of up to 50 m • Generally fresh groundwater (<1000 mg/L TDS) • Moderate to good bore yields (up to 2000 kL/day) • Groundwater levels tend to be deeper and more stable in coastal areas • Inland, water tables are shallower, supporting groundwater-dependent ecosystems such as wetlands and remnant vegetation 	West of the Brand Highway– Figure 2
Mirraboopa	<ul style="list-style-type: none"> • Partially unsaturated and highly variable thickness (sandstone, shale) • Semi-confined aquifer • Generally fresh groundwater (<1000 mg/L TDS) • Highly variable yields • Contributes to most of the summer flow in the headwaters of Gingin Brook including downstream of the Gingin town site to the confluence with Mungala Brook • Important for maintaining summer flows in the Moore River 	Eastern parts of plan area– Figure 3
Fractured rock	<ul style="list-style-type: none"> • Fractured and weathered crystalline bedrock • Very variable water quality • Low bore yields (<500 kL/day) • Small groundwater storage capacity 	Eastern margins of the plan area, east of the Darling Scarp– Figure 3
Cattamarra	<ul style="list-style-type: none"> • Sandstone and shale • Groundwater is brackish to saline 	Small area in the northwest of the plan area– Figure 4
Lesueur	<ul style="list-style-type: none"> • Mainly sandstone • Groundwater is fresh to brackish 	Small area in the northwest of the plan area– Figure 4

Aquifer	Description and notes	Location
Leederville	<ul style="list-style-type: none"> • Deep aquifer (Sandstone, shale), up to 550 m thick • Semi-confined to confined aquifer • Variable water quality, generally fresh groundwater (<1000 mg/L TDS) • Good bore yields (up to 3000 kL/day) • Provides baseflow to Gingin Brook downstream of Mungala Brook confluence • Seawater interface is likely to be offshore 	South of Wedge Island and west of the Brand Highway— Figure 4
Leederville– Parmelia	<ul style="list-style-type: none"> • Interconnected Leederville Formation and Parmelia Group (Sandstone, shale) • Semi-confined to the north become confined to the south • Generally fresh groundwater (<1000 mg/L TDS) • Good bore yields (up to 3000 kL/day) • Recharged in north-eastern part of the Gingin groundwater area as well as in the Jurien and Arrowsmith groundwater areas. • Contributes to baseflow in headwaters of the Gingin Brook and downstream sections • Important for maintaining summer flows in the Moore River 	East of the Brand Highway— Figure 4
Yarragadee	<ul style="list-style-type: none"> • Deep aquifer (Sandstone, shale), up to 2000 m thick • Unconfined to confined aquifer • Generally fresh groundwater (<1000 mg/L TDS) however, high groundwater salinity along the Darling Fault (Scarp) • Very good bore yields (up to 5000 kL/day) • Seawater interface is likely to be offshore 	Present in most of the plan area— Figure 5

The department has divided the plan area into 25 subareas for administrative purposes (Figures 3, 4, 5 and 6). In total, there are 35 ‘water resources’ covered by the plan. A ‘water resource’ is a portion of a particular aquifer present in a particular subarea. We have set an allocation limit for each of these resources.

For this plan, we have made the following changes to the subarea boundaries from the 2002 interim strategy:

- The Deepwater Lagoon North subarea has now been amalgamated into the Gingin Townsite subarea to manage the superficial aquifer as a single resource in this part of the plan area (Figure 2).
- The Leederville–Parmelia aquifer was managed as three separate subareas (SA4, SA5 and SA6). We have now amalgamated these three subareas into a single subarea called the Cowalla subarea, and the aquifer is now managed as a single resource in the Gingin plan area (Figure 4).

- The Yarragadee aquifer was managed in six separate subareas (SA1, SA2, SA3, SA4, SA5 and SA6). These have now been amalgamated into three new subareas: Cataby (SA1 and SA4), Wannamal (SA2 and SA5) and Chandala (SA3 North and SA6) (Figure 5).

When the *Gnangara groundwater areas allocation plan* (DoW 2009a) was developed, the original SA3 subarea was divided along Gingin Brook resulting in the formation of SA3 North (within Gingin plan area) and SA3 South (within the Gnangara plan area). Further information can be found in the *Gnangara groundwater areas allocation plan* (DoW 2009a).



Figure 2 Subareas covering the superficial and surficial aquifers

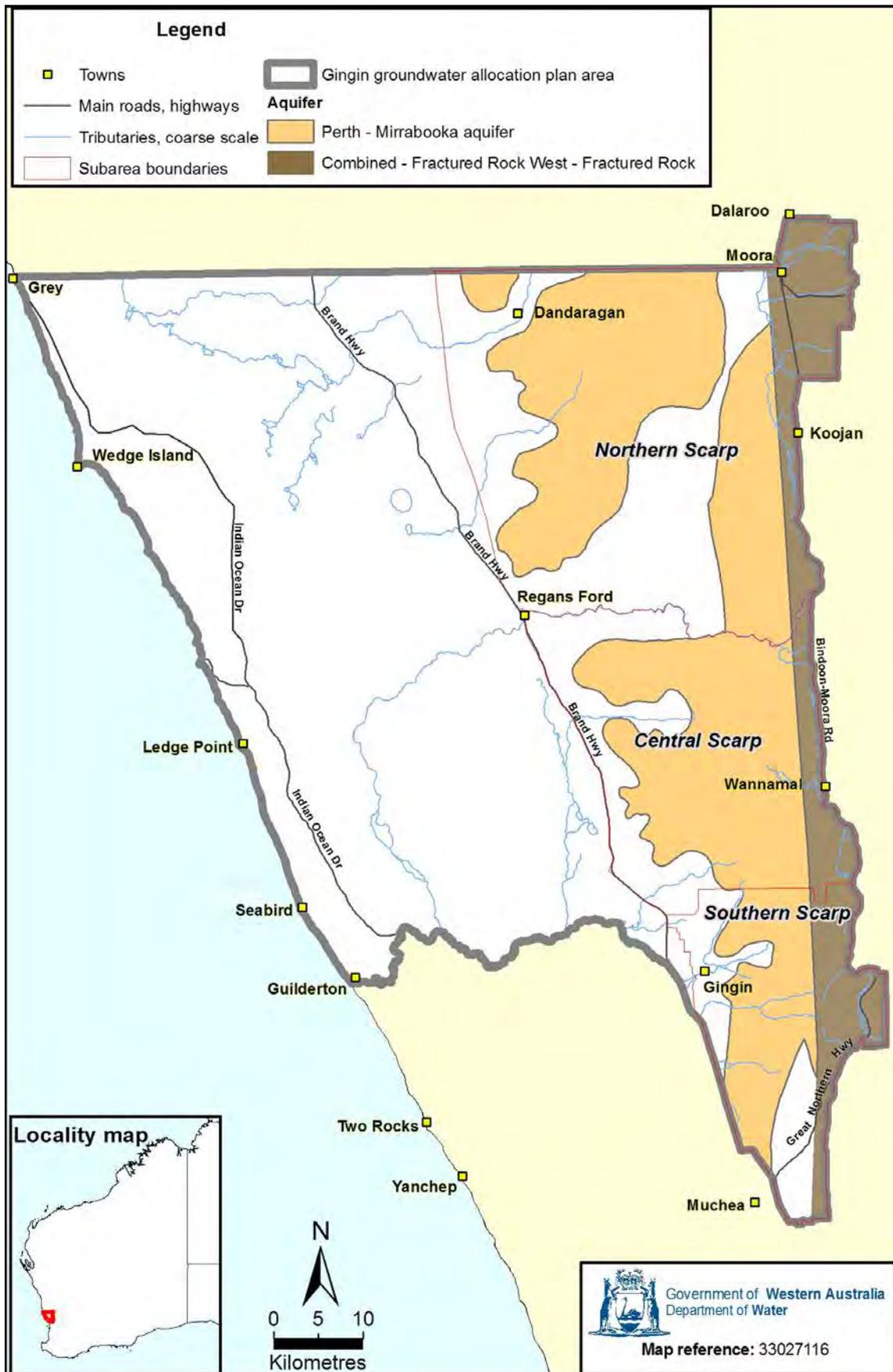


Figure 3 Subareas covering the Mirrabooka and fractured rock aquifers



Figure 4 Leederville, Leederville–Parmelia, Lesueur and Cattamarra aquifer subarea boundaries

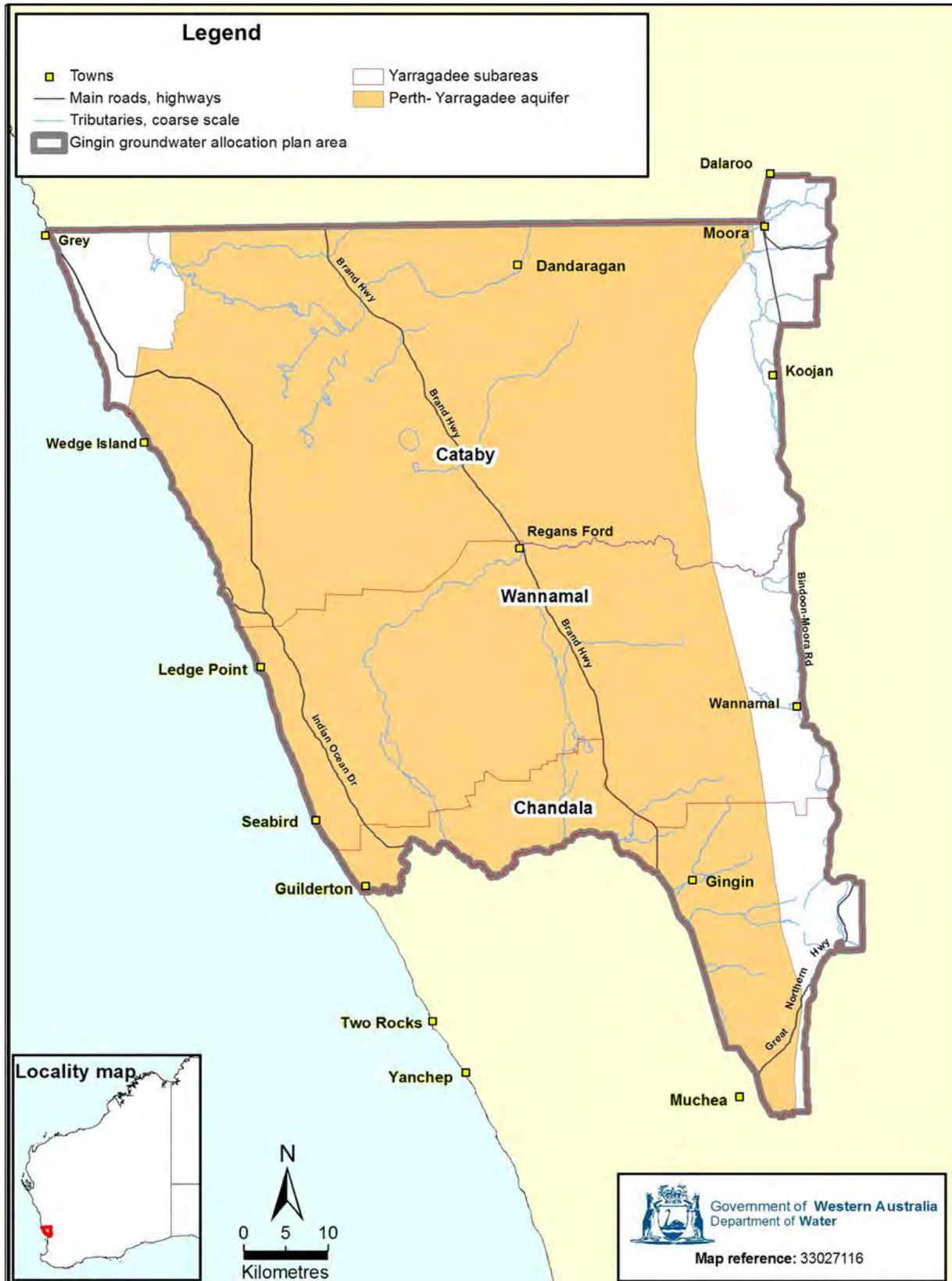


Figure 5 Yarragadee aquifer subarea boundaries

1.4 How we developed the plan

The department began work on the *Gingin groundwater allocation plan: for public comment* in 2009. A number of questions needed to be answered during planning:

- How has reduced rainfall affected recharge?
- Where are groundwater levels declining and by how much?
- How can the effects of a drying climate be managed?
- What do stakeholders value and what are their concerns?
- How can the groundwater-dependent environment be supported?
- Can current and future demand for groundwater be met?

To answer these questions, the department used updated rainfall data, analysed trends in groundwater levels, examined climate trends, consulted stakeholders, investigated projected population growth in the region, reviewed licensing data and explored recent findings on the surface water–groundwater interaction along Gingin Brook.

As the basis of our allocation limit decisions we calculated the amount of aquifer recharge (the amount of rainfall that becomes groundwater stored in the aquifers) for each of the 35 resources in the plan area. This included an adjustment for the continuation of the drying trend being experienced in the south west of Western Australia.

More information on our recharge calculations and how the allocation limits were set is summarised in Sections 3.3 and 3.4 and described in detail in *Gingin groundwater allocation plan methods report* (DoW 2013). Other work which informed this allocation plan is published in:

- *Gingin aquifer trend review* (MWH 2010)
- *Gingin surface water allocation plan* (DoW 2011a)
- *Groundwater–surface water interaction along Gingin Brook Western Australia* (Tuffs 2011).

For more information about the allocation planning process, please refer to *Water allocation planning in Western Australia: a guide to our process* (DoW 2011b).

1.5 Stakeholder interests

The department consulted with stakeholders during preparation of the plan to assess the importance of groundwater to the community. Stakeholders were kept informed of progress via periodic newsletters and updates on the department's website. In addition to the newsletters, we held community information sessions. The water-related issues raised by stakeholders and the community were:

- concern that the reliability of their licence entitlement will be affected by other nearby abstractions, or by development of the Gingin groundwater resources currently reserved for Perth's Integrated Water Supply Scheme (IWSS)
- a high social and environmental value attached to Gingin Brook and Moore River, with particular concern for the streams being affected by surface water and groundwater abstraction and for the lower flows being observed (as in 2010) as a result of low rainfall
- the need to improve opportunities to trade in areas that are fully-allocated.

We will use submissions received during the public comment period to update and finalise the plan.

1.6 Plan timeframe

The *Gingin groundwater allocation plan* will be in effect until it is replaced by a new water allocation plan or it is amended or revoked by the Minister for Water. The Department of Water will consider the need to replace this plan in 2020, unless the need is identified earlier, during the plan's evaluation (Chapter 6).

2 What the plan will achieve

The department is responsible for managing water resources in Western Australia consistent with the objects of the *Rights in Water and Irrigation Act 1914*, specifically:

- a) to provide for the management of water resources, and in particular –
 - i. for their sustainable use and development to meet the needs of current and future users; and
 - ii. for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them.
- b) to promote the orderly equitable and efficient use of water resources.

Through the planning process, the department determines the amount of water that can be taken from a water resource, without compromising reliability of supply or damaging the environment. This plan establishes the total volume of water that can be reliably taken from the aquifers every year for each of the 35 water resources in the Gingin plan area in most years.

Further information on the decisions we made is provided in the supporting document, *Gingin groundwater allocation plan methods report* (DoW 2013).

2.1 Outcomes

This plan will reduce the risks to water users and the environment from declining annual rainfall and over-abstraction. The outcomes for this plan are that:

- licensed entitlements can be met reliably in most years
- sufficient water is available for future local development and urban expansion, as well as the option to provide groundwater to Perth's IWSS
- groundwater-dependent ecosystems and watercourses are protected from over-abstraction
- groundwater quality in the coastal aquifers is protected from seawater intrusion.

2.2 Water resource objectives

In administering the Act, the department makes provision for both the sustainable use and development of water resources as well as the protection of ecosystems associated with water resources. Water resource objectives in allocation plans relate to maintaining, increasing, improving, restoring, reducing or decreasing surface water flow, groundwater levels or water quality.

The water resource objectives for this plan are as follows:

- a) Annual average rate of change in groundwater level or pressure head is proportional to and less than the decline in the rate of annual average recharge.

- b) Groundwater levels or pressure heads are within a target range to reduce the risk of adverse effects on groundwater-dependent ecosystems and/or baseflow in the Gingin Brook and Moore River.
- c) There is sufficient groundwater throughflow in coastal aquifers to reduce the risk of seawater intrusion.

2.3 Strategies

The department's strategies for meeting the water resources objectives are to:

- license and manage to the allocation limits for each of the 35 groundwater resources in the plan area (Chapter 3)
- reserve water for future local and regional public water supply (Chapter 3)
- issue licences according to the allocation and licensing policies outlined in this plan (Chapter 4)
- recover unused licensed allocations in over-allocated resources (Chapter 4)
- investigate potential breaches of licence conditions and take appropriate enforcement action (Chapter 4)
- monitor groundwater resources regularly using selected bores from the department's regional monitoring network (Chapter 5)
- evaluate whether the plan objectives are being met and adjust our management response accordingly (Chapter 6).

2.4 Measuring the success of the plan

The department will evaluate the plan regularly to see if the outcomes and resource objectives are being met. To evaluate the plan we will assess:

- licensing and water use data
- the condition of the water resource using monitoring information and performance indicators (Table 8).

We will publish the results in an evaluation statement. Chapters 5 and 6 provide more information about how the department will monitor and evaluate the performance of the plan.

3 Water allocation limits

This chapter sets out:

- the allocation limits for consumptive use in each groundwater resource
- the water to be left in aquifers to maintain water quality, aquifer productivity, groundwater-dependent values and other non-consumptive uses.

3.1 Allocation limit

The allocation limit is an annual volume of water set aside for consumptive use from a water resource. In the Gingin plan area, the allocation limit represents the total volume of water that can reliably be taken annually from each resource.

The allocation limit does not include water to be left in aquifers.

The allocation limits for the 35 resources in the Gingin plan area are shown in Table 2. These allocation limits are annual totals. The department will allocate water up to the allocation limit for each resource in accordance with the licensing and allocation approach described in Chapter 4. Once a resource is fully-allocated, the department will refuse applications for new entitlements (including increases to existing entitlements). However, other options such as trading may be available.

The total allocation limit is 235 GL/yr across the 35 resources.

Licence applicants are encouraged to contact our Swan–Avon regional office in Victoria Park on (08) 6250 8000 for up-to-date water availability information and to discuss opportunities for obtaining water by trading or from alternative sources. Water availability information is also available from the department's online Water Register at <www.water.wa.gov.au> Business with water> Water trading and register>.

3.2 Components of the allocation limit

For administrative purposes, the allocation limit is divided into components for:

- Water that is available for licensing
 - general licensing
 - public water supply licensing
- Water that is exempt from licensing
- Water that is reserved for future public water supply.

General licensing

The general licensing component of the allocation limit includes the total volume of water which can be issued as annual licence entitlements for all uses except public water supply. As at November 2012, there was approximately 141 GL/yr licensed and 30 GL/yr in licence applications.

Public water supply

The public water supply component of the allocation limit is the volume of water that is licensed to water service providers. Currently, the Water Corporation has licences in six resources within the plan area.

Unlicensed use - water exempt from licensing

The unlicensed use component of the allocation limit is the volume of water set aside for uses that are exempt from licensing under the Act (refer to Section 4.1 for further information). There is just under 3.4 GL/yr of groundwater for stock and domestic use accounted for in this plan.

The amount of exempt stock and domestic use in the plan area was calculated using information provided by the Department of Agriculture and Food. This included the number of properties within each subarea, land-use mapping, stocking patterns and average stock water requirements.

Exempt water use was not included in the 2002 allocation limits.

Reserved water

The reserved water component is water for future public water supplies. The department has adjusted the public water supply reserves as part of revising the allocation limits for this plan.

As at November 2012, 41 GL/yr is reserved across nine resources in this plan (Table 2) for future local public water supply and as an option for the Perth Integrated Water Supply Scheme (IWSS). The 2002 interim strategy reserved 72.5 GL/yr for future public water supply.

Aquifers in the Gingin and Jurien groundwater areas have long been identified as a potential future water supply option for Perth. However, to date, other options have been more feasible. With increasing demand, the Gingin/Jurien option may be re-evaluated during the next 10 to 20 years.

Table 2 Allocation limits for the Gingin plan area

Groundwater resource (subarea and aquifer)		Allocation limit components (ML/yr)				
		Allocation limit	Licensable		Unlicensed	Reserved water
			General	Public water supply	Exempt	Public water supply
Superficial and surficial aquifers						
Beermullah Plain North	Superficial	6 500	6 370	0	130	0
Bindoon	Surficial	2 400	1 925	0	475	0
Eclipse Hill	Superficial	1 050	980	0	70	0
	Surficial	3 000	3 000	0	0	0
Gingin Townsite	Superficial	920	865	0	55	0
	Surficial	5 000	5 000	0	0	0
Guilderton North	Superficial	6 500	5 510	370	120	500
Karakin Lakes	Superficial	17 000	12 240	120	140	4 500
Lancelin	Superficial	21 000	13 875.5	1 409.5	215	5 500
Moora	Surficial	800	730	0	70	0
Namming Lake	Superficial	10 500	10 465	0	35	0
	Surficial	300	300	0	0	0
North Moore River Park	Superficial	12 900	9 840	0	60	3 000
Red Gully	Superficial	750	710	0	40	0
	Surficial	5 600	5 600	0	0	0
Seabird	Superficial	17 000	12 790	0	210	4 000
South Moore River Park	Superficial	7 500	7 425	0	75	0
Victoria Plains	Surficial	4 400	4 400	0	0	0
Wedge Island	Superficial	58 500	48 565	0	185	9 750
	Surficial	3 000	3 000	0	0	0

Groundwater resource (subarea and aquifer)		Allocation limit components (ML/yr)				
		Allocation limit	Licensable		Unlicensed	Reserved water
			General	Public water supply	Exempt	Public water supply
Leederville, Cattamarra, Lesueur, Mirrabooka and fractured rock aquifers						
Central Coastal	Leederville	2 800	2 700	100	0	0
Northern Coastal	Cattamarra Coal Measures	250	250	0	0	0
	Lesueur Sandstone	1 700	0	0	0	1 700
Southern Coastal	Leederville	4 100	630	470	0	3 000
	Leederville	1 000	1 000	0	0	0
Central Scarp	Mirrabooka	1 500	1 135	0	365	0
	Fractured Rock	50	50	0	0	0
Northern Scarp	Mirrabooka	3 700	3 070	0	630	0
	Fractured Rock	50	50	0	0	0
Southern Scarp	Mirrabooka	800	285	0	515	0
	Fractured Rock	50	50	0	0	0
Leederville–Parmelia aquifer						
Cowalla	Leederville–Parmelia	19 000	17 617.3	1 382.7	0	0
Yarragadee aquifer						
Cataby	Yarragadee	13 000	4 000	0	0	9 000
Wannamal	Yarragadee	1 300	1 300	0	0	0
Chandala	Yarragadee	850	850	0	0	0
Total		234 770	186 577.8	3 852.2	3 390	40 950

3.3 How the allocation limits were set

The department set the allocation limits after balancing the need to make water available for use and retaining water in the aquifers to support groundwater levels and aquifer throughflow. To set allocation limits we assumed a 15 per cent reduction in average annual recharge by 2020. This is consistent with dry climate projections for the south-west of Western Australia. In our recharge calculations we also accounted for aquifer outcrop area, current vegetation cover, soil type and aquifer characteristics.

We considered the proportion of recharge to be retained in each aquifer for each subarea depending on presence of groundwater dependent systems, contribution to river baseflow and proximity of the seawater interface. We compared this to the amount of water needed to meet current use and future demand. Where demand was greater than supply, we considered how to use allocation limits, licensing and monitoring in a complementary way to manage the risks and revised the proportion of recharge to be retained or allocated to best meet all needs. In some cases, the allocation limits represent a trade off between competing needs. The effectiveness of the allocation limits will be assessed annually through our plan evaluation process.

Over-allocated subareas

Allocation limits are lower than licensed entitlements where there is an unacceptable risk that currently licensed water use will diminish groundwater levels to the point that:

- the reliability of supply for existing licensees will be too low
- the groundwater dependent environment will be lost or permanently damaged.

Eight resources are now classified as over-allocated:

- Beermullah Plain North–superficial
- Eclipse Hill–superficial
- Guilderton North–superficial
- Red Gully–superficial
- Central Coastal–Leederville
- Cowalla–Leederville–Parmelia
- Southern Scarp–Mirrabooka
- Wannamal–Yarragadee.

The volume of licensed entitlements has not changed significantly in these resources since 2009. The approach to managing over-allocated resources is described in Chapter 4.

3.4 Water that is left in aquifers

As a result of our allocation limit decisions for each resource, a proportion of aquifer recharge is left to support environmental features (Table 3). Water that is not abstracted:

- contributes to supporting environmental and social values dependent on groundwater
- supports baseflow in the Gingin Brook and Moore River
- protects water quality by maintaining the seawater interface.

Table 3 Percentage of recharge retained in aquifers

Aquifer	Percentage of recharge that is left in aquifers
Surficial	20
Superficial	25, 30, 40
Mirrabooka	80
Southern Coastal Leederville	40
Northern and Central Coastal Leederville	10
Leederville–Parmelia	10
Yarragadee	10

For further information on how we set allocation limits and water to be left in the aquifers, refer to the *Gingin groundwater allocation limit methods report* (DoW 2013).

Environmental and social values dependent on groundwater

In the Gingin plan area, groundwater-dependent ecosystems are common in areas where the superficial aquifer exists because the aquifer is close to the surface across large areas. Throughout the coastal plain (Figure 6), there are a number of swamps and wetlands in topographic and inter-dunal depressions and also at the base of the Gingin Scarp (approximately the position of the Brand Highway in Figure 6).

Up to 40 per cent of recharge is left in surficial and superficial resources to support groundwater-dependent ecosystems. The highest proportions of recharge (30 and 40 per cent) are left in subareas with the largest areas of remnant vegetation and groundwater-dependent ecosystems.



Figure 6 Groundwater-dependent values in the plan area derived by combining remnant vegetation and wetlands with depth-to-groundwater data

Baseflow in the Gingin Brook and Moore River

Parts of Gingin Brook are now dry in summer. This is partly due to a drying climate and depending on location, water abstraction. Declining groundwater levels and consequently groundwater discharge to Gingin Brook and Moore River could make flows more ephemeral in some river reaches.

Groundwater is discharged from the Leederville–Parmelia and Mirrabooka aquifers and is the source of baseflow in the headwaters of Gingin Brook.

The plan supports baseflow in Gingin Brook and Moore River by leaving a percentage of recharge in the Leederville–Parmelia and Leederville aquifers (40 per cent) and Mirrabooka aquifer (80 per cent). A high proportion of recharge is left in the Mirrabooka aquifer because it is the source of all summer flow in Moore River and in the downstream sections of Gingin Brook between Gingin townsite and the confluence with Mungala Brook.

The department manages the impacts of licensed abstraction from the rivers with the *Gingin surface water allocation plan* (DoW 2011a) pumping using allocation limits, local licensing rules and baseflow monitoring.

Streamflow at Gingin Brook gauging station is one of our performance indicators for the Gingin groundwater allocation plan (Table 8 in Section 5.1). We will also investigate options for licensing the take of water should baseflow reach the low-flow threshold as explained in the *Gingin surface water allocation plan* (DoW 2011a) (Action 6 in Table 10).

The department has undertaken an extensive investigation of the surface water–groundwater interaction along Gingin Brook. As part of future management for the plan area, the department is considering undertaking a study of similar scale for the Moore River (Action 7 in Table 11).

Protecting water quality by maintaining the seawater interface

Groundwater in the Leederville and Yarragadee aquifers generally flows westward and eventually discharges offshore into the ocean. This prevents seawater from entering into the onshore, freshwater aquifers.

As a result of our allocation limit decisions, 10 per cent of the aquifer recharge the coastal Leederville and Yarragadee aquifers will be left to reduce the risk of seawater intrusion.

The presence of the Lancelin Formation confining bed and the significant groundwater pressure head (14 to 18 m AHD) in the Leederville and Yarragadee aquifers at the coast is likely to provide an effective barrier against seawater intrusion during the life of this plan.

During the life of the plan, the department will review the status of the groundwater pressure heads in the confined aquifers at the coast annually. Any significant reduction outside the normal historical range (14 to 18 m AHD) for groundwater

pressure head in the Leederville and Yarragadee aquifers will trigger a review of the risk of seawater intrusion.

The department is installing additional monitoring bores in these aquifers to help us better understand and manage the seawater interface in the plan area. Refer to Section 5.2 for additional information on this project.

4 Water allocation and licensing approach

Water licences are the regulatory instruments the department uses under the *Rights in Water and Irrigation Act 1914* to manage the individual take of groundwater and surface water.

In the Gingin groundwater plan area and other areas where water users legally require a licence, the department uses policies to guide how we assess licence applications and apply conditions to licences.

This plan includes local policies to manage water allocation and licensing in the plan area. It provides guidance for assessing licence applications as well as the specific conditions to apply to licences, including operating strategies associated with individual licences.

4.1 Legislative requirements

The department manages water on behalf of the state under the *Rights in Water and Irrigation Act 1914*. The Act establishes the legislative framework for managing and allocating water in Western Australia. In administering the Act, we also abide by other state and federal legislation.

Water users in the plan area require a water licence to lawfully take groundwater under section 5C of the Act. Water users also require a licence issued under section 26D of the Act to construct or alter wells, unless specified in an exemption order.

When assessing a water licence application, the department considers the allocation plan, as well as clause 7(2) of Schedule 1 of the Act.

In granting a licence, the department may apply terms, conditions and restrictions to licences under clause 15 of Schedule 1 of the Act. This may also include the requirement for an operating strategy.

The department's requirements for altering any licence condition are specified under clause 24(1) of Schedule 1 of the Act.

The rights of licensees are covered under clause 26 of the Act. Any decision made on a licence application can be reviewed through the State Administrative Tribunal.

Exemptions

Private, domestic water supply from the superficial aquifer is managed through the *Rights in Water and Irrigation Act Exemption and Repeal (section 26C) Order 2011*.

Taking groundwater from the watertable aquifer in the plan area is exempt from licensing where it is used solely for:

- fire fighting purposes
- watering of stock, other than those raised under intensive conditions

- household purposes and domestic garden and lawn irrigation (not exceeding 0.2 ha).

The *Rights in Water and Irrigation Exemption (Dewatering) (section 26C) Order 2010* applies in the Gingin groundwater area. This Order exempts small short-term dewatering projects.

The *Rights in Water and Irrigation Exemption (section 26C) Order 2012* also applies in the Gingin plan area. This Order exempts licensing under section 5C (take of water) and 26D (construction of wells) of non-artesian monitoring wells where the sole purpose of the well is for monitoring water levels or water quality. For further information, please contact the department's Swan–Avon regional office in Victoria Park.

Compliance and enforcement

The *Rights in Water and Irrigation Act 1914* requires people and organisations to acquire appropriate authorisation to take water. If the authorisations are not demonstrated or the conditions of a licence are breached, the department will take enforcement action.

Public drinking water source protection areas

Parts of the Gingin plan area are proclaimed for the protection of public drinking water supplies under the *Country Areas Water Supply Act 1947*. These are the:

- Dandaragan Water Reserve
- Moora Water Reserve
- Lancelin Water Reserve
- Seaview Water Reserve
- Ledge Point Water Reserve
- Sovereign Hill Water Reserve
- Guilderton Water Reserve
- Gingin Water Reserve
- Bindoon/Chittering Water Reserve.

The department has water source protection plans for these areas. Water source protection plans, assessments, policies and water quality protection notes are available on our website: <www.water.wa.gov.au>.

If groundwater is to be used for private drinking water supplies, the department recommends that it be filtered, treated and tested according to public health advice from the Department of Health. For more information, also see the department's water quality protection notes, Australian drinking water guidelines (Australian Government 2004) and the Australian fresh and marine water quality guidelines (ANZECC & ARMCANZ 2000).

4.2 Approach to allocating water

The department's approach to allocating water in the Gingin area will achieve the objectives set out in Chapter 2. The department uses the licensing process to allocate the available water up to the allocation limits set in Chapter 3.

First-in first-served

The department will generally apply a first-in-first-served approach as well as applying other local and statewide policies when assessing applications for water licences.

Managing water in over-allocated resources

The department will recoup unused water entitlements (or unused portions of entitlements) in accordance with the *Statewide Policy no. 11—Management of unused licensed water entitlements* (WRC 2003b).

When recouping water reduces entitlements to below the allocation limit in an over-allocated resource, the department will review the resource's performance and either:

- make the portion of recouped water below the allocation limit available for licensing, or
- reduce the allocation limit and not make the portion of recouped water below the allocation limit available for licensing.

Any amendment of the allocation limit will be supported by an assessment of the monitoring data from the resource. The recouped water will not be made available for licensing if the monitoring data indicates a declining trend in groundwater levels (Action 2 in Table 10).

Accessing water for future public water supply

Approximately 41 GL/yr is reserved for future public supply across several aquifers and subareas. Development of reserves for local supplies will be through an investigation, assessment and licensing process established by the department with the local water service provider.

Before water reserved as an option for Perth's Integrated Water Supply Scheme (IWSS) could be developed:

- Government with the Water Corporation (Perth's water service provider) would identify the timing for considering the next IWSS source option and a process for selecting a water supplier.
- The Department of Water would manage a process to gazette Public Drinking Water Source Protection Areas.
- The selected bulk water provider would be required to undertake local hydrogeological investigations and assessment to confirm groundwater yields and identify issues to support a water licence application.

- The Department of Water would assess the licence application and determine appropriate licence conditions.
- The water service provider and Water Corporation would make business and infrastructure arrangements for connection to the IWSS.

Taking water from the Mirrabooka aquifer

The Mirrabooka aquifer is present in the eastern portion of the plan area. The aquifer is partially saturated, variable in thickness and is connected with the shallow watertable in certain areas. As the aquifer's thickness is variable, yields from it vary from location to location.

Due to the variability in yields and connection to the shallow watertable, applicants will be required to conduct aquifer tests to confirm bore yield and submit this information to the department. In this case, applicants may also be asked to provide additional information such as lithology and geophysical logs (Table 4). This will allow the department to assess the potential of the proposed abstraction to affect groundwater users and the environment. We encourage applicants who are applying to take water from the Mirrabooka aquifer to contact the department's Swan–Avon regional office in Victoria Park for more information.

Taking water from fractured rock aquifers

Compared to sedimentary aquifers such as the superficial aquifer that can hold large volumes of water and yield up to 20 L/s, fractured rock aquifers east of the Darling Scarp have a small storage capacity and provide variable bore yields (up to 6 L/s) from highly fractured and weathered zones. The fractured rock aquifers in the plan area vary in their distribution and hydrogeological properties. This means that the yield of these aquifers cannot be calculated accurately and the allocation limit for these resources is not a true indication of water availability.

Applicants for licences to abstract from fractured rock aquifers may be required to conduct aquifer tests to confirm bore yield to allow the department to assess the potential for effects on other groundwater users and the environment. In cases where the allocation limit has been reached in the fractured rock aquifers, aquifer test evidence may be sufficient for the department to consider increasing the allocation limit. We encourage applicants who are applying to take water from the fractured rock aquifers to contact the department's Swan–Avon regional office in Victoria Park for more information.

4.3 Approach to water licensing

A water licence authorises legal access to water. We issue water licences to manage abstraction at an individual scale to support development, protect the entitlements of existing water users and maintain the environment.

The department will also consider legislative requirements or policies of other government agencies (for example, land zoning and planning documents of local

government authorities) to ensure that land and water use are integrated where possible.

The department will refuse a licence application if the allocation limit would be exceeded or local impacts will be unacceptable. Where a resource is fully-allocated, people wishing to gain new groundwater entitlements should consider transactions with existing licensees (transferring or trading existing water entitlements or reaching an agreement to use an existing water entitlement).

The department carries out regular licence compliance audits to make sure that water take and use is in accordance with licences and their conditions. During auditing, the department reviews monitoring data and any metering data and assesses whether there are any local impacts, to ensure that the licence conditions are appropriate.

4.4 Licensing policies

Local licensing policies for the Gingin plan area

For this plan, statewide policies and the department's licensing process will be employed to assess licence applications. Where local issues may not be addressed in statewide policy, the local licensing policies in Table 4 apply in the plan area. Where local policy in this allocation plan differs from a statewide policy, the policy in this plan applies.

Table 4 Licensing policies specific to the Gingin plan area

Policy group	Policy detail
1. Licence assessment	
1.1 Information required from new bores drilled into the Mirrabooka aquifer	<p>New applications for a licence in the Mirrabooka aquifer will be requested to support their application with:</p> <ul style="list-style-type: none"> • a detailed description of the lithology, with retention of lithology drill samples • geophysical log – gamma and resistivity (long- and short-normals) • aquifer tests and results from these tests • survey level of bore • palynology analysis of lithology drill samples may also be required.
1.2 Managing applications in resources that contribute to baseflow in Gingin Brook and Moore River	<p>Applicants proposing to have production bores close to Gingin Brook or Moore River must demonstrate that pumping from their bores will not significantly reduce baseflow in these watercourses. Production bores should be located at least 400 m from these watercourses to minimise impacts on baseflow.</p> <p>Applicants proposing to have production bores close to Gingin Brook or Moore River may be required to provide a hydrogeological assessment to demonstrate that their abstraction will not significantly reduce baseflow in these watercourses. Monitoring bores may need to be installed as part of any licence conditions to monitor impacts of abstraction.</p>
1.3 Managing applications in coastal resources	<p>For licence applications in the coastal resources, the department may require applicants to install bores to monitor water quality as part of any licence conditions.</p>
1.4 Trading within the Cowalla Leederville–Parmelia resource	<p>When assessing trades in the Cowalla Leederville–Parmelia resource, the department will be guided by the trading zones defined in Figure 7. The department is likely to support trades in a northerly direction that decrease the risk to groundwater-dependent ecosystems and baseflow in the Gingin Brook and that alleviate abstraction pressure in the southern portion of the Leederville–Parmelia resource.</p> <p>Trading rules between and within zones are outlined in Table 5. Applicants are encouraged to contact the department's Swan–Avon regional office in Victoria Park for more information.</p>

Policy group	Policy detail
1.5 Applications to take water for future public water supplies outside of the Gingin plan area	Licence applications should not be made outside a water supply planning process identified by government.



Figure 7 Trading zones for the Leederville–Parmelia resource

*Table 5 Trading rules between and within zones in the Cowalla Leederville–
Parmelia resource*

		Trading to		
		Zone 1	Zone 2	Zone 3
Trading from	Zone 1	Trading is permitted.	Trading is not permitted.	Trading is not permitted.
	Zone 2	Trading is permitted.	Trading is permitted.	Trading is not permitted.
	Zone 3	Trading is permitted.	Trading is permitted.	Trading is permitted.

4.5 Statewide licensing policies

The department develops policies that apply to all water resources across the state, including the Gingin plan area. Table 6 describes the main statewide strategic and operational policies that apply in this area. An up-to-date list of the policies is available on our website: <www.water.wa.gov.au> Doing business with us > Water licensing>.

Table 6 Statewide policies that apply in the Gingin area

Policy	Application
Licence assessment	
<i>Operational policy no. 5.11 – Timely submission of required further information (DoW 2009b)</i>	<p>The department's approach to managing timelines when a licensee is requested to submit additional information in support of their licence application.</p> <p>The department's approach for securing sufficient water entitlements for staged developments. The policy:</p> <ul style="list-style-type: none"> • applies to proponents who are unable to use their total entitlement within two years of commencing the development • ensures that licensed entitlements are actively used for the benefit of the licence holder, the community and the state • reduces the possibility of purely speculative bids for limited water resources • does not apply to water service providers or water transactions and transfers.
<i>Statewide policy No. 9 – Water licensing – staged developments (WRC 2003a)</i>	
Licence conditions	
<i>Strategic policy 5.03 – Metering the taking of water (DoW 2009c)</i> <i>Guidelines for water meter installation (DoW 2009d)</i> <i>Rights in Water and Irrigation (Approved Meters) Order 2009</i>	<p>States the department's position on metering the taking of water in Western Australia. Under this policy, the department is most likely to impose metering conditions on individual licensees to assess and monitor trades.</p> <p>Guidance on when an operating strategy is required and what it should contain, including:</p> <ul style="list-style-type: none"> • the licence applicants who are likely to require an operating strategy • how operating strategies form part of the conditions of a water licence • how licence applicants should develop an operating strategy • the licensee's responsibilities in complying with an operating strategy.
<i>Operational policy no. 5.8 – Use of operating strategies in the water licensing process (DoW 2010)</i>	

Policy	Application
Managing water to maximise use	
<p><i>Operational policy no. 5.01 – Managing water reserved for use by drinking water service providers (DoW 2011c)</i></p>	<p>Where there are no current plans by water service providers to develop the water reserved for future use, the reserved water may be made available temporarily to applicants that have demonstrated a need to access those resources for a clearly specified period, not exceeding 10 years, that:</p> <ul style="list-style-type: none"> • does not conflict with the timeframe of the reserve’s intended purpose • maintains the value of the reserved water resources for the intended purpose.
<p><i>Operational policy no. 5.13 – Water entitlement transactions for Western Australia (DoW 2009e)</i></p>	<p>Temporarily allocated water entitlements will not be tradeable and in general, licences will not be renewed.</p>
<p><i>Statewide policy no. 11 – Management of unused licensed water entitlements (WRC 2003b)</i></p>	<p>The rules for a trade, transfer or lease of all, or part of, a licensed water entitlement.</p> <p>The circumstances when whole or portions of licensed entitlements may be recouped by the department to maximise development opportunities, including:</p> <ul style="list-style-type: none"> • if it is proved that the entitlements are consistently unused • if extenuating circumstances cannot be provided.

4.6 Factors that may affect future water allocation and licensing

The department expects significant and rapid urban growth in the next 20 years in areas adjacent to the coast in the plan area as part of the northwards expansion of Perth. We have reserved groundwater for future public water supply in some resources as part of this plan.

Before placing an application for a groundwater licence, proponents considering developments in these areas are encouraged to contact the department to discuss water availability and access to the public water supply reserves.

5 Monitoring program for the Gingin groundwater plan area

The monitoring program sets out how the department will monitor water resources in the plan area. It will tell us how the resources are performing over time and in particular, how they are responding to abstraction and climate change. Using that information, we will evaluate whether the plan's resource objectives are being met and whether we need to adapt our management of abstraction.

The department has a regional monitoring network of bores that covers the plan area that has recorded changes in groundwater levels since the 1970s (Table 7 and Figure 8).

The regional monitoring network is used for calibrating the Perth regional aquifer modelling system (PRAMS). The department will use the PRAMS groundwater model to assess monitoring information at a regional scale and evaluate the performance of the Gingin plan.

The department obtains most of its water quality information and information about local impacts on groundwater-dependent ecosystems from licensees.

Table 7 Number of monitoring bores in the Gingin plan area (regional monitoring network)

Aquifer	Bore series	Number of monitoring bores	Total
Superficial	Cataby Shallow	28	73
	Gillingarra Line	3	
	Gingin Monitoring	10	
	Salvado Line	11	
	Gingin Brook Series	21	
Mirrabooka	Gingin Brook Series	8	10
	Red Gully Series	1	
	Gillingarra Line	1	
Leederville and Leederville–Parmelia	Gingin Brook Series	4	22
	Cataby Shallow	1	
	Gillingarra Line	12	
	Red Gully Series	3	
Yarragadee	Artesian Monitoring	2	16
	Moora Line	4	
	Cataby Shallow	4	
	Gillingarra Line	8	
Total			121

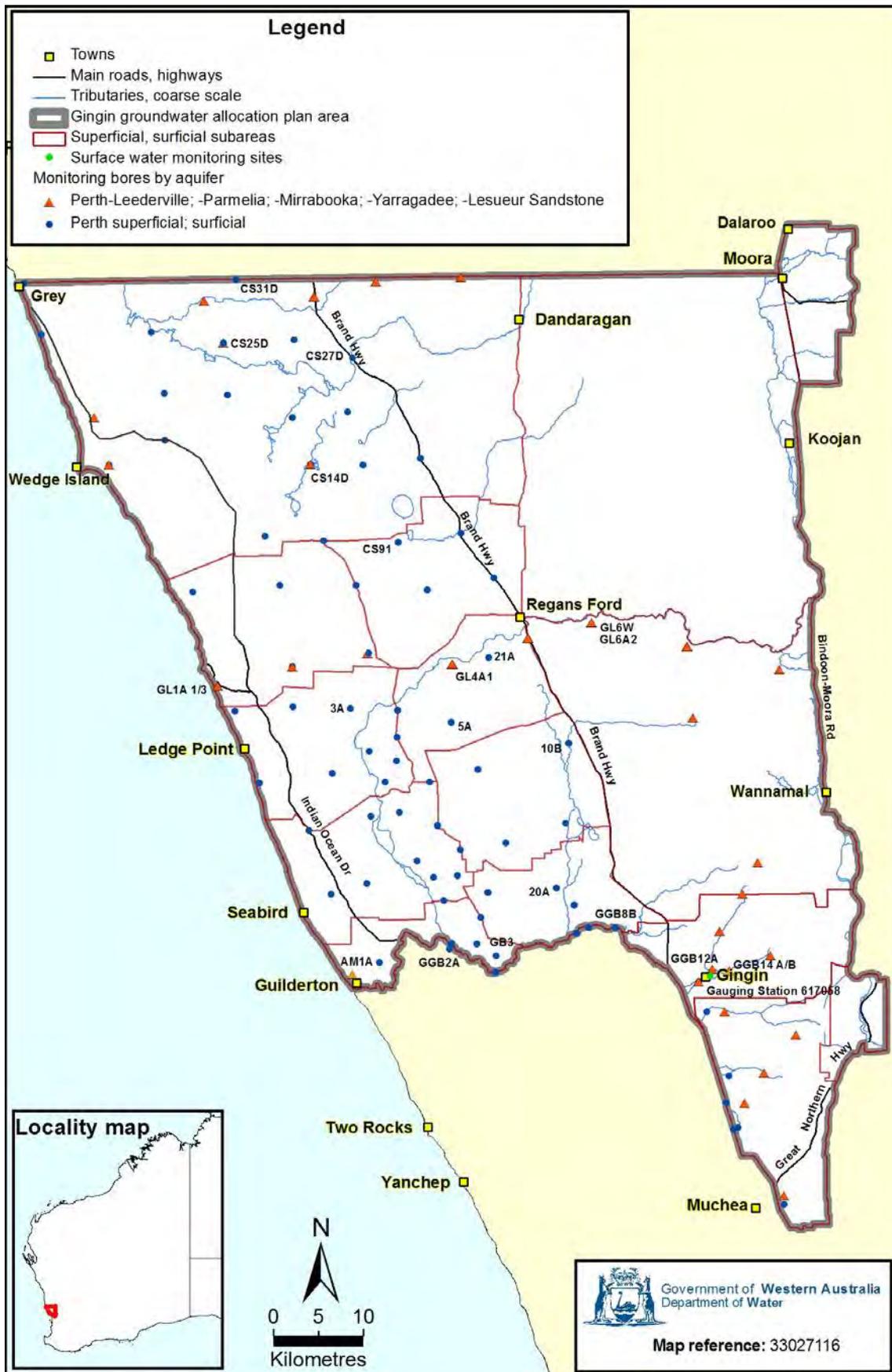


Figure 8 Location of Department of Water monitoring bores in the plan area

5.1 Evaluating resource objectives

The department will regularly review information from individual bores to determine whether the plan's resource objectives are being met. We will use the performance indicators in Table 8 to monitor our progress. When the department evaluates the plan, we may change monitoring bores to assess the aquifer's performance.

Table 8 Monitoring and performance indicators in the plan area to assess resource objectives for each aquifer

Resource objective	Sites	Performance indicator	Frequency
Superficial aquifer			
a) Annual average rate of change in groundwater level is proportional to and less than the decline in the rate of annual average recharge.	Bore 3A Bore 5A Bore 10B	Monitoring bore data show that the rate of change in groundwater level over the last five years is similar to the rate of change in recharge over the same period (hydrographs will be used for verification).	Annually
b) Groundwater levels are within a target range to reduce the risk of adverse effects on groundwater-dependent ecosystems.	Bore 20A Bore 21A Bore CS28D Bore CS31D Bore CS27D Bore CS9I Bore GB3 Bore GGB2A Bore GGB8B	Subarea inflows are greater than the best estimate abstraction data (using water balance calculations).	Annually
c) There is sufficient groundwater throughflow in coastal aquifers to reduce the risk of seawater intrusion.		Groundwater modelling (PRAMS) indicates that groundwater flow is in a westerly direction.	Annually
Mirraboooka aquifer			
a) Annual average rate of change in pressure head is proportional to and less than the decline in the rate of annual average recharge.	Bore GL7W	Monitoring bore data show the rate of change in pressure head over the last five years is similar to the rate of change in recharge over the same period (hydrographs will be used for verification).	Annually

Resource objective	Sites	Performance indicator	Frequency
b) Pressure heads are within a target range to reduce the risk of adverse effects on groundwater-dependent ecosystems and/or baseflow to the Gingin Brook and Moore River.	Bore GGB14B	Pressure head at GGB14B will remain above the base of Moondah Brook for a majority of the year (hydrographs will be used for verification).	Annually
	Gingin Brook gauging station 617058	Streamflow does not drop below 10 ML/day at Gingin Brook gauging station for more than two consecutive days in a year.	Annually
Leederville and Leederville–Parmelia aquifers			
a) Annual average rate of change in pressure head is proportional to and less than the decline in the rate of annual average recharge.	Bore AM1 Bore CS14D Bore GGB14A Bore GL1A1 Bore GL6W	Monitoring bore data show the rate of change in pressure head over the last five years is similar to the rate of change in recharge over the same period (hydrographs will be used for verification).	Annually
		Subarea inflows are greater than best estimate abstraction data (using water balance calculations).	Annually
d) Pressure heads are within a target range to reduce the risk of adverse effects on groundwater-dependent ecosystems and/or baseflow to the Gingin Brook and Moore River.	Bore GGB14A	Pressure head at GGB14A will remain above the base of Moondah Brook for a majority of the year.	Annually
	Gingin Brook gauging station 617058	Streamflow does not drop below 10 ML/day at Gingin Brook gauging station for more than two consecutive days in a year.	Annually
Yarragadee aquifer			
a) Annual average rate of change in pressure head is proportional to and less than the decline in the rate of annual average recharge.	Bore CS25D Bore GL1A3 Bore GL4A1 Bore GL6A2	Monitoring bore data show the rate of change in pressure head over the last five years is similar to the rate of change in recharge over the same period (hydrographs will be used for verification).	Annually

Resource objective	Sites	Performance indicator	Frequency
		Subarea inflows are greater than best estimate abstraction data (using water balance calculations).	Annually
e) There is sufficient groundwater throughflow in coastal aquifers to reduce the risk of seawater intrusion.	Bore AM1A Bore GL1A3	No significant reduction outside of the normal historical range (13 to 18 m AHD) for groundwater pressure heads in the Yarragadee aquifers at the coast (hydrographs will be used for verification).	Annually

5.2 Monitoring for future planning needs

The Gingin plan area has few deep monitoring bores for evaluating the seawater interface in the confined Leederville and Yarragadee aquifers at the coast. The department's North Gingin Groundwater Investigation Project, funded through the State Groundwater Investigation Program, will install four lines of deep Leederville and Yarragadee aquifer monitoring bores on the Swan Coastal Plain. There will be a total of 24 deep monitoring bores installed (Table 9). The four lines of monitoring bores will be positioned within the Gingin plan area between the coastal settlements of Seabird in the south and Wedge Island in the north and move inland to the Brand Highway near Gingin Scarp in the east.

Construction of the new monitoring bores started in 2012 and will be completed in 2014. Prior to the completion of the North Gingin Groundwater Investigation, existing deep monitoring bores at Guilderton (AM1A, just outside the southern boundary of the plan area) and Lancelin (GL1A3, GL1A1 and GL1B) were used to estimate the distance of the seawater interface offshore. The new bores will enable us to better understand and manage the confined groundwater resources in the Gingin groundwater area. The bore construction program also ensures that we are well placed to manage growth in the demand for water, which is occurring as a result of horticultural ventures moving northwards from the Gnangara area. The new data collected will also improve our conceptual geology model and be incorporated into and update the PRAMS model.

Following the installation of the monitoring bores on the coastal plain, the project will extend eastward to fill the monitoring gap on the Dandaragan Plateau. It is anticipated that this work will begin in 2015–16.

Table 9 New monitoring bores from the North Gingin groundwater investigation

New monitoring bores	Purpose	Frequency of data collection
North Gingin 1 – 12 B	Monitor the Leederville aquifer Provide data for input to PRAMS	Yet to be determined
North Gingin 1 – 12A	Monitor the Yarragadee aquifer. Provide data for input to PRAMS	Yet to be determined

6 Implementing and evaluating the plan

The department will implement the *Gingin groundwater allocation plan* by:

- licensing in accordance with the allocation limits for each subarea (Chapter 3)
- issuing licences according to the allocation and licensing approach (explained in Chapter 4)
- monitoring and reviewing measurement data (as set out in Chapter 5)
- following the strategies listed in Section 2.3.

Once the plan is in place, we will regularly evaluate whether its objectives are being met by conducting periodic plan evaluations.

This chapter sets out additional actions to implement and evaluate the final *Gingin groundwater allocation plan*, including provisions to identify if and when a new plan is required.

6.1 Implementing the plan

The department has identified a number of actions that we will carry out over the next seven years (Table 10). We identified these actions during the planning process after:

- identifying the gaps in our current knowledge and information
- reviewing current management arrangements
- assessing what information we need for future planning.

Table 11 lists the actions that will help us manage supply for consumptive use as well as the environment. These actions will also improve our knowledge of the groundwater system and water use in the Gingin plan area.

Table 10 Actions to implement the Gingin groundwater allocation plan

Action	Responsibility ¹	Timeline	
Resource assessment			
1	Assess the condition and performance of the groundwater resources.	Water Information Water Resource Assessment	Annually through the monitoring program
Allocation planning			
2	Review allocation limit if water is recouped to below the allocation limit in over-allocated resources.	Water Allocation Planning Swan–Avon Region	As required
Licence compliance			
3	Undertake targeted meter readings and meter compliance inspections.	Swan–Avon Region	Annually
Monitoring			
4	Review, and amend where appropriate, the current groundwater monitoring program.	Water Resource Assessment	Annually
Communication and evaluation statement			
5	Produce and publish a periodic evaluation statement on the plan and its implementation.	Water Allocation Planning	One year after the plan is finalised and then as required
6	Develop a communication and education program with groundwater users within resources that contribute to baseflow to raise awareness of the effect of abstraction on baseflow.	Water Allocation Planning Swan–Avon Region	2014

¹Departmental branch responsible for the action

Table 11 Actions to support future planning

Action	Responsibility	Timeline	
7	Confirm areas and aquifers that contribute to Moore River baseflow.	Water Resource Assessment	As funding becomes available
8	Investigate options for managing groundwater abstraction when baseflow in Gingin Brook is below a low flow threshold as outlined in the <i>Gingin surface water allocation plan</i> (DoW 2011b).	Water Allocation Planning Water Resource Assessment Swan–Avon Region	Ongoing
9	Refine understanding of water requirements of groundwater-dependent ecosystems.	Water Allocation Planning	As funding becomes available

6.2 Evaluating the plan

An evaluation statement will be released that describes the response of the groundwater resources to our management and compares these to the plan objectives. We will publish the evaluation results in an evaluation statement periodically.

The evaluation statement will include:

- the status of allocation and use for each resource, including any changes in licensed entitlements since the last year
- the status of the plan actions due in the evaluation period
- the department's performance against the plan outcomes, water resource objectives and performance indicators
- any changes to water resource management triggered by the plan evaluation.

The statement will be available on the department's website or by contacting the department's Swan–Avon regional office in Victoria Park.

Appendices

Appendix A – Map information and disclaimer

Map information and disclaimer

Datum and projection information

Vertical datum: Australian Height Datum (AHD)

Horizontal datum: Geocentric Datum of Australia 94

Projection: MGA 94 Zone 50

Spheroid: Australian National Spheroid

Project information

Client: K Youngs and M Tiong

Map authors: G. Floyd, D. Abbott, C Samuel, S Shah and M Fifield

File path: J:\gisprojects\Project\330\20000_29999\33027116..For all maps

File name:

J:\gisprojects\Project\330\20000_29999\33027116\0001_Gingin_Allocation_Plan..For all maps

Compilation date: 28 September 2012

Disclaimer

These maps are a product of the Department of Water, Water Assessment and Allocation Division and were printed as shown.

These maps were produced with the intent that they be used for information purposes at the scales as shown when printed.

While the Department of Water has made all reasonable efforts to ensure the accuracy of this data, the department accepts no responsibility for any inaccuracies and persons relying on this data do so at their own risk.

Sources

The Department of Water acknowledges the following datasets and their custodians in the production of these maps:

Western Australia Towns – Landgate – 2012

Hydrography, Linear (Hierarchy) – DoW – 2007

Global Map Data Australia 1M – Geoscience Australia – 2001

Road Centrelines, DLI – Landgate – 2012

WA Coastline, WRC (Poly) – DoW – 2006

Local Government Authority and Locality Boundaries – Landgate – 2012

DWAID Aquifers – Dow – 2012
DWAID Groundwater Subareas – DoW – 2012
WIN Monitoring Boreholes – DoW – 2012
WIN Surface Water Sites, Stream Gauging (DoW) – DoW – 2012
Groundwater Allocation Plan Area – DoW – 2012
Proclaimed Groundwater Areas – DoW - 2007
DIWA Wetlands – DoW – 2008
Mean Annual Rainfall Surface (1975-2003), Southwest Australia – DoE – 2006
Mid-West Potential GDE and Associated Values – DoW – 2012
WA Satellite Imagery – Landgate – 2005

Shortened forms

AHD	Australian height datum
DoW	Department of Water
DWAID	Divertible water allocation information database
IWSS	Integrated Water Supply Scheme
PRAMS	Perth regional aquifer modelling system
SA	Subarea
TDS	Total Dissolved Solids
WRC	Water and Rivers Commission

Volumes of water

One litre	1 litre	1 litre	(L)
One thousand litres	1000 litres	1 kilolitre	(kL)
One million litres	1 000 000 litres	1 megalitre	(ML)
One thousand million litres	1 000 000 000 litres	1 gigalitre	(GL)

Glossary

Abstraction	Withdrawal of water from any surface water or groundwater source of supply.
Allocation limit	Annual volume of water set aside for use from a water resource.
Consumptive use	Water used for consumptive purposes considered as a private benefit including irrigation, industry, urban and stock and domestic use.
Environmental water requirement (EWR)	The water regime needed to maintain the current ecological values (including assets, functions and processes) of water dependent ecosystems consistent with the objectives of an environmental flow study.
Environmental water provision (EWP)	The water regime resulting from the water allocation decision-making process taking into account ecological, social, cultural and economic impacts. They may meet in part, or in full, the ecological water requirements.
Fit-for-purpose water	Water that is of the quality suitable for the intended end purpose. It implies that the quality is not higher than needed.
<i>In situ</i> water	Represents water than needs to be left in the system, including the water needed to maintain the integrity of resource, ecological, social and cultural values.
Licence (or licensed entitlement)	A formal permit which entitles the licence holder to take water from a watercourse, wetland or underground source under the <i>Rights in Water and Irrigation Act 1914</i> .
Management area	A defined surface water area or groundwater area proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> .
Over-allocation	Where the total volume of water allocated out of the resource (that could be abstracted at any time) is over the set allocation limit.
Over-use	Where the actual volume of water abstracted from the resource is over the set allocation limit.
Reliability	The frequency with which a water licence holder can take their full licensed volume.

Self-supply	Water users (individuals or organisations) who divert from a source for their own individual requirements.
Social value	An <i>in situ</i> quality, attribute or use that is important for public benefit, welfare, state or health.
Social water requirement	The water regime needed to maintain social and cultural values.
Subarea	A subdivision, within a surface or groundwater area, defined to better manage water allocation. Subareas boundaries are not proclaimed and can therefore be amended without being gazetted.
Water reserve	An area proclaimed under the <i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i> or <i>Country Areas Water Supply Act 1947</i> to protect and use water for public water supply.
Yield	The amount of water that can be abstracted out of the system, after environmental water is met.

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Department of Water

168 St Georges Terrace, Perth, Western Australia

PO Box K822 Perth Western Australia 6842

Phone: 08 6364 7600

Fax: 08 6364 7601

www.water.wa.gov.au

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