A Regulatory Framework for Groundwater Management in a Drying South West: Draft Report for Consultation

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Michael Bennett and Alex Gardner
Faculty of Law, The University of Western Australia
Contents
Preface to Draft Report ................................................................................................................... vi
Acknowledgements ....................................................................................................................... vii
Executive summary ...................................................................................................................... viii

Part I: Setting the Scene
1. Groundwater policy and regulation ............................................................................................. 1
  1.1 Policy objectives for groundwater management ................................................................. 1
  1.2 Legal models for groundwater management ..................................................................... 3
  1.3 Western Australia’s regulatory framework ........................................................................... 4
  1.4 Water law reform in Western Australia ............................................................................. 15
2. Groundwater challenges in a drying South West ...................................................................... 17
  2.1 Water resources of the South West ..................................................................................... 17
  2.2 The drying trend and its impacts on water resources .......................................................... 17
  2.3 Future scenarios for groundwater in the South West ......................................................... 26

Part II: Elements of an Improved Regulatory System
3. Overview of regulatory issues and reforms ............................................................................... 28
4. Broader regulatory coverage ...................................................................................................... 30
  4.1 Unlicensed water use in a drying climate ........................................................................... 30
  4.2 Basic landholder rights - domestic garden bores ............................................................... 30
  4.3 Commercial plantations ..................................................................................................... 32
5. Better groundwater planning ..................................................................................................... 36
  5.1 Statutory water plans and sustainable extraction limits ......................................................... 36
  5.2 A duty to consider and address risks from climate change ................................................. 38
  5.3 Sharing groundwater with the environment in a drying climate ..................................... 41
  5.4 Links between groundwater planning and other planning processes ......................... 46
6. Flexible water entitlements ....................................................................................................... 49
  6.1 The need for flexibility in a drying climate ........................................................................ 49
  6.2 Problems with the existing entitlements system ............................................................... 49
  6.3 An alternative approach: share-based entitlements ......................................................... 55
  6.4 Risk assignment and compensation ............................................................................... 59
  6.5 Improved water accounting ............................................................................................. 61
7. Greater use of water markets ................................................................................................... 65
  7.1 Water markets and climate change adaptation ............................................................... 65
  7.2 Allocating groundwater .................................................................................................. 66
  7.3 Trading groundwater ..................................................................................................... 72
8. Other issues ............................................................................................................................. 77

8.1 Regulation of managed aquifer recharge ............................................................................. 77
8.2 Administrative reforms ......................................................................................................... 77

Appendix A ................................................................................................................................ 79
Appendix B ................................................................................................................................ 80
Appendix C ................................................................................................................................ 81
Appendix D ................................................................................................................................ 82
Appendix E ................................................................................................................................ 84
Appendix F ................................................................................................................................ 86
Appendix G ................................................................................................................................ 87
Appendix H ................................................................................................................................ 89

References ................................................................................................................................... 91

List of figures
Figure 1: Water resources of the South West ............................................................ viii
Figure 2: When is a licence required to take groundwater?.................................................. 9
Figure 3: Rainfall trend in Western Australia (1970-2012) .................................................... 18
Figure 4: Annual rainfall in SWWA (1900-2013) ................................................................. 18
Figure 5: Winter rainfall in SWWA (1900-2013) ................................................................. 18
Figure 6: Streamflow to Perth Dams (1911-2011) ............................................................... 20
Figure 7: Water sources for the Integrated Water Supply System (1940-2023)..................... 21
Figure 8: Gnangara Mound (superficial aquifer) depletion (1979-2009) ............................... 23
Figure 9: Yarragadee Aquifer (deeper aquifer) pressure levels (1973-2011) ....................... 24
Figure 10: Water table trend in the southern Perth Basin (1980-2007) ................................. 24
Figure 11: Projected water table trend in the southern Perth Basin (CSIRO mid-range scenario) 27
Figure 12: Unlicensed use crowds out licenced use in a drying climate .............................. 30
Figure 13: Comparison between 1987 CSIRO scenario for Perth and average rainfall ........ 39
Figure 14: Non-compliant sites on the Gnangara Mound (% of total sites) ......................... 43
Figure 15: Recognising over-allocation: adjustment to allocation limits in a drying climate 49
Figure 16: The Variable Groundwater Abstraction Rule ...................................................... 53
Figure 17: Current entitlements vs NWI entitlements ......................................................... 56

List of tables
Table 1: Examples of provisions in South West groundwater allocation plans .................. 5
Table 2: Common conditions on groundwater licences in the South West ....................... 10
Table 3: Recognised over-allocation in South West groundwater management areas (2014)...... 25
Table 4: Factors affecting watertable decline on the Gnangara Mound ............................... 33
Table 5: Existing regulatory mechanisms to address over-allocation .................................. 50
Table 6: Over-allocation in Collie Groundwater Area (2009-2014) ............................................... 52
Table 7: Gnangara groundwater system: licenced entitlements in over-allocated areas .......... 54
Table 8: Contributions of major water sources to the Perth metropolitan area water supply .... 54
Table 9: Licenced entitlements in over-allocated areas, Wanneroo .............................................. 54
Table 10: Examples of NWI-consistent water access entitlements ................................................ 56
Table 11: Examples of rules for water allocations against water access entitlements ........... 57
Table 12: Availability of third party appeals against decisions to grant water licences in Australia 78
Preface to Draft Report

The South West of Western Australia – which we define broadly to include an area stretching from Geraldton to Albany – has experienced significant challenges from a drying climate over recent decades. The scientific evidence suggests that this drying climate is linked to human-induced climate change, and that further drying is likely as greenhouse gas concentrations in the atmosphere increase. The drying climate is already having very serious consequences for water resources management.

While steps clearly need to be taken to reduce emissions, this Report focuses on adaptation of water resources management, especially in relation to the future of groundwater management and regulation in the South West. This is an important issue, given that groundwater makes up around three quarters of all water used in the South West and supports important environmental assets, including internationally recognised wetlands. The Report analyses existing legislation in the light of academic commentary, government reports and case studies and recommends a series regulatory reforms designed to adapt groundwater management to a drying climate.

The Report has two key aims: to contribute to the debate on new water resource management legislation proposed for Western Australia, and to contribute to the scholarship on ‘climate adaptation law’ pertaining to water resource management. In doing so, we are conscious of the value of the South West of Western Australia as a ‘field laboratory’ of climate change adaptation.¹

We are releasing this Report as a draft to seek feedback on the reform proposals and case studies. We are particularly keen to hear from community members who have direct experience of groundwater management and regulation, and views on how it could work better in a drying South West climate.

We will be holding workshops, meetings and interviews in April 2014. If you would like to register your interest in any of these events, or have any questions about the project, please feel free to contact us on michael.bennett@uwa.edu.au or alex.gardner@uwa.edu.au.


Michael Bennett and Alex Gardner
Faculty of Law, The University of Western Australia
Researchers with the National Centre for Groundwater Research and Training

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We would also like to thank the Department of Water for providing Michael Bennett with a desk in its Water Allocation Planning Branch for one day a week during the research phase for this report. This ability to have regular contact with the talented and dedicated staff of the Department was a great help in going beyond black letter law to build an understanding of how groundwater regulation works in practice.

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Executive summary

Groundwater in a drying South West

The community of South West Western Australia is facing an enormous water resources challenge from climate change, which is raising fundamental questions about the regulatory framework for managing groundwater. Do we need to extend groundwater regulation? Do we need a more rigorous approach to setting allocation limits? Can we continue with fixed, volumetric water rights in a drying climate? What should be the role for water markets in distributing water rights?

The South West of Western Australia is home to around 2 million people, some 90 per cent of Western Australia’s population. This community is fortunate to have the benefit of substantial groundwater resources, which meet around three quarters of its water needs, along with the needs of the natural environment including internationally-significant wetlands and groundwater-dependent threatened species.

Figure 1: Water resources of the South West

The South West has experienced a significant drying trend over recent decades. This decline in winter rainfall (17 per cent since the 1970) has been associated with a dramatic decline in streamflow to South West reservoirs (more than 50 per cent). There has also been a substantial impact on groundwater resources – both directly, through reduced recharge to aquifers, and
indirectly through increased demand for groundwater as a substitute for increasingly scarce surface water resources.

A number of peer-reviewed scientific papers, and a major research venture carried out by the CSIRO, Bureau of Meteorology and WA Government, have linked the decline in South West rainfall to climate change caused by greenhouse gas emissions. Whatever the cause of past drying, there is a high degree of agreement among climate models that the South West will experience a drying trend in future decades due to human-induced climate change. The impact on groundwater yields will be modest in some areas, but very substantial in others. Yield declines may be greater than one-third by 2030 in the Gngangara, Blackwood and Albany groundwater areas. Impacts on surface-water resources will also have an impact by increasing demand for alternative water sources such as groundwater.

The science suggests that effective action to stabilise greenhouse concentrations could reverse this trend, but that it would take several centuries to full reverse. While not detracting from the importance of reducing greenhouse gas emissions, this does underline the importance of considering how the South West can adapt to a dryer future. This report considers how the design of the regulatory framework for groundwater management can help meet this important challenge.

Research questions and directions for reform

In this report we seek to address the following fundamental questions for groundwater management and regulation:

- How can groundwater use be maintained within sustainable limits in a drying climate, and how can groundwater be used productively and efficiently within these limits?
- What role does the regulatory framework for groundwater management have in achieving these goals?

From an analysis of the existing regulatory framework, an assessment of how it has operated in practice and consideration of approaches in other jurisdictions we have identified four main directions for reform, which we outline below. The first three (broader regulatory coverage, better groundwater planning and flexible water access entitlements) relate to the goal of keeping groundwater use within sustainable limits in a drying climate. The fourth (greater use of water markets) relates to the productive and efficient use of groundwater.

1. Broader regulatory coverage

There is value, in a drying climate, in bringing existing, unlicensed uses within the regulatory framework as far as possible. Otherwise there is a risk that these unlicensed uses will expand, unconstrained by an allocation limit, to the detriment of groundwater-dependent ecosystems or licenced water users. There are two problematic currently unlicensed water uses of groundwater: domestic garden bores and commercial plantations.

Domestic garden bores are widely used in the South West. The Department of Water estimated in 2009 that there were 167,000 garden bores in the Perth Metropolitan Area, with total water use in
the order of 73 gigalitres (GL) a year. These garden bores are currently exempt from usual licensing requirements, but this needs to be reconsidered in a drying climate – particularly in vulnerable areas, such as those that are already over-allocated or are close to wetlands.

**Law Reform Recommendation: Domestic Garden Bores**

Consideration should be given to two options:

- to license new and existing domestic garden bores in specified areas; or
- to prohibit the construction of new domestic garden bores in specified areas.

To minimise regulatory costs, the second option could be implemented by licensing drillers of wells rather than the owners of garden bores. These options could be implemented under existing legislation or the new water resource management legislation.

It is clear from studies of the Gnangara Mound that commercial plantations can have a significant impact on groundwater levels in a drying climate by reducing aquifer recharge. However, managers of commercial plantations do not currently need to obtain a water licence. This can be contrasted with the approach in South Australia, which is the first Australian jurisdiction to include commercial plantations within its water management regime. The South Australian reforms only came into effect in October 2013, so it is difficult to assess their usefulness in practice. Even so, they appear to offer a workable approach to regulating the hydrological impacts of commercial plantations.

**Law Reform Recommendation: Commercial plantations**

Western Australia’s new water resource management legislation should recognise commercial plantations as a consumptive use of groundwater resources and have the capacity to licence water use by commercial plantations.

2. **Better groundwater planning**

Good water allocation planning is central to maintaining groundwater use within sustainable limits in a drying climate. We identify two important elements of good water allocation planning: the use of statutory water allocation plans to provide a consistent, legally secure basis to set and administer allocation limits; and statutory requirements that provide a sound basis to set and achieve sustainable allocation limits.

**Law Reform Recommendation: Statutory water allocation plans**

The legislation should:

- provide for the making of statutory water allocation plans that must be tabled in Parliament and may be disallowed
- require those plans to:
  - identify the sustainable yield of each groundwater resource and explain how that figure was calculated
  - explain any discrepancy between the sustainable yield and the allocation limit
- specify the monitoring that is to be carried out to assess whether the allocation limits and objectives of the plan are being achieved, and the reporting of that information.
While projections of reduced rainfall due to climate change were taken into account for water supply planning purposes from the late 1980s, they were only directly incorporated in assessments of groundwater allocation limits from 2009, some two decades later. Our analysis of groundwater allocation plans in the South West shows that there is still only one finalised plan that uses climate change projections. The Department of Water has recently done a significant amount of work in developing tools and guidelines to facilitate the use of climate projections in water allocation planning. To ensure that climate change is addressed in the making of water allocation plans we recommend that the new water resource management legislation require the Minister to consider climate change risks in plan preparation and to address those risks in the plan provisions.

**Law Reform Recommendation: Duty to consider and address climate change in making statutory water allocation plans**

The legislation should require the Minister to consider climate change risks in the preparation of statutory water allocation plans and to address those risks in the plan provisions.

While the water planning process needs to be made as comprehensive as possible, other planning processes will continue to be relevant to groundwater management in a drying climate. One important area is water supply and demand management planning. While detailed consideration of this issue is outside the scope of this report, consideration should be given to whether public water supply and demand management planning should be given a legislative basis, or at least formalised through a Code of Practice under the Water Services Act 2012 (WA). If this happens, the risks of climate change, and associated responses, should be a mandatory consideration.

### 3. Flexible water access entitlements

Groundwater resources are likely to diminish in a drying climate because of reduced groundwater recharge. This raises the question, in areas that are already fully allocated, of whether the regulatory system is capable of adjusting the volume of water that can be taken under water access entitlements in order to keep total groundwater extraction within sustainable limits, over the medium to longer term and in extreme drought.

Under current law and practice, groundwater entitlements are volumetric – that is, licensees are entitled to extract a specified volume of water each year. During temporary severe water shortages these entitlements may be reduced by ministerial direction, and no compensation is payable. These powers have not been exercised in the past twenty years, even though it is arguable that there have been seasonal circumstances that could have warranted their application. Further, volumetric groundwater entitlements may be reduced permanently on various grounds and no compensation is payable if the reduction is ‘fair and reasonable’ amongst licensees. In practice, this power has not been exercised in over-allocated groundwater areas in the South West. This may be because licensees have an expectation of a fixed annual entitlement and because it would be administratively onerous to amend a large number of licences individually and deal with resulting merits appeals to the State Administrative Tribunal.

The introduction of a more flexible entitlements system, consistent with Western Australia’s commitments under the National Water Initiative (‘NWI’), would make it easier to manage allocations within sustainable limits in a drying climate. Under this system, water users would hold perpetual share entitlements in a consumptive pool and available water can be accessed in
proportion to the share. This consumptive pool could be varied in response to seasonal circumstances, in accordance with rules in the relevant statutory water plan, in order to keep allocations to entitlements within sustainable limits. Variation of the consumptive pool would affect all water users equally, so that the allocation is proportional to the share and no compensation would be payable.

Law Reform Recommendation: A more flexible entitlements system
The legislation should provide greater flexibility to adjust levels of groundwater extraction in response to seasonal circumstances through non-compensable adjustments made by:
- a new system of water entitlements that provide access to a share of a consumptive pool determined periodically rather than to a fixed annual volume of water; and
- pending the introduction of those entitlements, powers to vary more easily the volume of water that may be taken under existing licences.

The legislation should also provide that, where necessary, permanent reductions to groundwater entitlements can be made to adapt to a drying climate. If there is no currently applicable statutory plan, this adaptation is best undertaken by making a statutory plan. If there is an existing statutory plan, then a permanent reduction of entitlements can be made by plan amendment, usually at a time prescribed for regular plan review. Such regular review might take place, for example, every ten years, but there should also be ministerial authority to change a plan during the ten year term. If an existing plan provides for consumptive pool determination, then the entitlement reduction can be undertaken by amending the relevant plan rules for determining the consumptive pool. This form of plan amendment may or may not affect all water users equally.

Law Reform Recommendation: A regular plan review of entitlements
The legislation should provide a capacity for longer term adjustments to climate change impacts by providing for:
- regular plan review every ten years; and
- a fair process by which the minister may amend plan provisions to re-set the regime of rules for determination of the consumptive pool and share entitlements.

The legislation should also provide for how the risk of loss from entitlement reductions made by plan amendments is assigned between water users and government. In all Australian jurisdictions that have implemented the NWI a periodic adjustment to a consumptive pool, made in accordance with a statutory water plan, will apply equally to all entitlement-holders and is not compensable. However, permanent adjustments to the reliability of water access entitlements through plan amendments, either during the term of a plan or at the end of the plan term, raise more difficult questions of compensation. Water users who invest on the basis of a plan-defined entitlement may legitimately anticipate some security of entitlement during the term of the plan.

One approach put forward in the NWI, which has been adopted in some Australian jurisdictions, is to provide that reductions in water access associated with plan amendments or new plans may be compensable, depending on the reason for the new approach. If the reduction is needed because of climatic changes no compensation is payable, but compensation may need to be paid if the consumptive pool is reduced because of changes in government policy or improvements in
knowledge. This approach is difficult to apply in practice because it is hard to apportion reductions in water entitlements between these different factors.

An alternative approach is to recognise that certainty is needed during the term of a plan, but a regular plan review at the end of the plan term is the opportunity for the community and the government to re-assess the long term sustainability of plan provisions of water for consumptive use and for environmental and other public benefit outcomes. The community and the government may then legitimately anticipate the capacity to re-set the plan regime without the burden of compensation unless the burden of entitlement reductions were to fall disproportionately on particular water users, so that water rights are effectively acquired for a public purpose identified in the new plan.

**Law Reform Recommendation: Risk assignment and compensation**

In general, no compensation should be payable for permanent reductions in water allocations under water access entitlements associated with adjustments to consumptive pools by regular end of term plan review and amendment. The exceptions to the general rule are that compensation should be payable to water users who incur permanent reductions in entitlements made:

- by plan amendment during the term of the plan, or
- by end of term plan review and amendment that imposes a disproportionate burden on particular water users so that rights are effectively acquired for a public purpose identified in the new plan.

A flexible water entitlements system will help to keep groundwater allocations within sustainable limits in a drying climate, but this will be to no effect if groundwater use exceeds those limits. We therefore support proposals in the Department of Water’s Position Paper, Reforming Water Resource Management (‘2013 Position Paper’) for increased metering, and suggest some additional reforms to increase compliance with metering requirements and disclosure of data obtained from metering.

**Law Reform Recommendation: Improved water accounting**

The legislation should provide for:

- the implementation of increased metering as proposed by the 2013 Position Paper,
- a strengthening of enforcement provisions for non-compliance with licence conditions requiring metering and reporting, and
- reform of the provisions for the water register to mandate on-line publication of licence conditions for metering and of the metering data unless the licensee can show a good reason for non-disclosure.

### 4. Greater use of water markets

Water markets promote the productive and efficient use of water. They facilitate the movement of water to its most economically productive use, and by putting a price on water encourage physically efficient water use. Both of these things become increasingly important in a drying climate.
At present market-based mechanisms such as auctions are not used in the initial allocation of groundwater entitlements in the South West. Groundwater is normally allocated for free under a ‘first-in, first-served’ approach, in which the applicant who is first in time has priority over other applicants. This may in part be due to the fact that the current legislation does not provide a clear legal basis to release unallocated groundwater through market-based mechanisms. The new legislation should provide a clear legal basis for market-based mechanisms such as auctions in the initial allocation of water. In order to promote productive and efficient use of groundwater, these mechanisms should be considered the default approach for heavily allocated groundwater resources.

**Law reform recommendation: Initial allocation of groundwater through market-based mechanisms**

The legislation should provide a clear legal basis for the release of unallocated water through a range of mechanisms, including market-based mechanisms such as auctions. Market-based mechanisms should be considered the default approach for heavily allocated groundwater resources.

This raises the question of how the resulting revenue should be used. The State Government’s Water Reform Implementation Committee recommended in 2006 that the revenue be directed to water resource management. This would have the advantage of providing much-needed funding for water resource management and building support for the use of market-based mechanisms.

**Law reform recommendation: Use of revenue from groundwater allocation**

The revenue from the release of groundwater through auctions and other market-based mechanisms should be directed to water resource management.

We recognise that in some circumstances it may be appropriate to reserve water for particular uses where there is a clear public interest in doing so. This should be done through statutory water allocation plans in order to ensure that the reservation is properly considered and involves public consultation. Any such reservation would be complementary to, rather than in place of, market-based releases of water. Water that is reserved for a particular use could still be released through a market-based mechanism.

**Law reform recommendation: Reservation of groundwater**

The new water resource management legislation should provide that statutory water allocation plans may reserve water for specified purposes. Market-based mechanisms should remain the default approach for the release of ‘reserved’ water.

Water trading has been possible since 2001 amendments to the *Rights in Water and Irrigation Act 1914* (WA) (‘RIWI Act’), and a number of water trades have been carried out in South West groundwater areas. However, there are a number of barriers to trade. The State Government proposes to address some of these barriers to trade. One barrier that it does not propose to address is the requirement that the person purchasing the water entitlement must be the owner or occupier of land from which the water is taken, or have an agreement with that person.
Law Reform Recommendations: Water trading
The legislation should be designed to facilitate trade in groundwater entitlements, including through implementation of the reforms outlined in the 2013 Position Paper. Consideration should also be given to removing the requirement that a purchaser of an entitlement must be an owner or occupier of the land from which the water will be taken.
1. Groundwater policy and regulation

This chapter provides context for the analysis in later chapters. It begins by considering, in broad terms, the policy objectives for groundwater management and some of the legal models that can help (or hinder) the achievement of those objectives. It then considers Western Australia’s regulatory framework, with a particular focus on how it has been applied to groundwater resources of the South West, and current proposals for reform of that framework.

1.1 Policy objectives for groundwater management

Groundwater managers, and those designing water resource management legislation, face two fundamental policy questions: what limits should be placed on the use of groundwater resources, and who should be able to access groundwater within those limits?

In Australia, as in other countries, the answer to the first question has been influenced by attitudes towards groundwater resources. Historically, groundwater resources were seen simply as a factor of production to be harnessed for agricultural and industrial development. To the extent that limits to groundwater use were considered at all, they were directed towards protecting existing groundwater users and the continued capacity to extract groundwater for development.

The emergence of the concept of sustainable development marked a new stage in the evolution of groundwater policy, along with other areas of natural resource management. The Rio Declaration on Environment and Development and Agenda 21 (1992) emphasised the need to limit resource use, including use of freshwater resources, to levels that could equitably meet the developmental and environmental needs of present and future generations.

This concept was endorsed in Australia, with some variations in terminology, in a number of policy statements and intergovernmental agreements, including the National Strategy on Ecologically Sustainable Development (1992), the Intergovernmental Agreement on the Environment (1992), the National Framework for Improved Groundwater Management in Australia (1996) and, most

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3 William M Alley and Stanley A Leake, ‘The Journey from Safe Yield to Sustainability’ (2004) 42(1) Ground Water 12; Western Australia, Parliamentary Debates, Legislative Assembly, 8 October 1912, 2292 (Minister for Lands) (advocating regulatory controls on artesian bores ‘so that there might be no serious loss in the future through a decrease in the flow from bores owing to an excess of bores in a certain area’).
recently, the Intergovernmental Agreement on a National Water Initiative (2004). Sustainable development and related concepts have been incorporated as guiding principles in Australian legislation, including water resource management legislation.

We make three initial observations on the meaning and application of ‘sustainable development’, ‘sustainable yield’ and similar terms in a groundwater context. First, what constitutes a sustainable yield depends on the nature of a groundwater resource. For example, different considerations may apply to shallow aquifers recharged by rainfall compared to confined aquifers storing ‘fossil water’. It has been suggested that ‘mining’ of the latter may be considered sustainable as long as it takes place in a planned way that leaves enough time for alternative water sources to be identified.

Second, important environmental assets and ecosystem functions must at least be identified; and further, under the relatively strong version of sustainability normally adopted in Australian policy statements (but not always followed through in practice) allocation limits should be consistent with the protection of those assets and functions.

Third, there is a healthy debate about the practical application of concepts like sustainable yield in a groundwater context. For example, the idea that abstraction should be no greater than natural recharge has been variously criticised as a ‘water budget myth’ and praised as a useful guide where it is not possible to develop an accurate numerical model of a groundwater system. There is also room for debate and different expert judgments on the groundwater flows needed to meet ecological requirements, particularly for groundwater-dependent ecosystems.

Taking these points together, it becomes clear that the identification of allocation limits demands a sophisticated assessment of the impacts that abstraction (and other factors such as land use change) will have on a dynamic groundwater system, and the environmental and social impacts that flow from this for present and future generations. Overlay the prospect of future climatic

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10 On ESD in Australian legislation see Gerry Bates, Environmental Law in Australia (LexisNexis Butterworths, 8th ed, 2013) 227-236; examples of relevant provisions in Australian water resource management legislation include Water Management Act 2000 (NSW) s 3; Water Act 2000 (Qld) s 10; and Natural Resources Management Act 2004 (SA) s 7; Water Act 2007 (Cth) ss 3, 21(4).
12 Australia’s Intergovernmental Agreement on a National Water Initiative, for example, requires that overdrawn water systems should be returned to an ‘environmentally sustainable level of take’. This is defined as ‘the level of water extraction from a particular system which, if exceeded would compromise key environmental assets, or ecosystem functions and the productive base of the resource’: Council of Australian Governments, above n 9 sch B(i).
13 J D Bredehoeft, ‘Safe yield and the water budget myth’ (1997) 35(6) Ground Water 929 (arguing that this is a ‘water budget myth’ because increased abstraction will lead to greater water capture by inducing greater recharge and reducing discharge)
14 Alley and Leake, above n 3, 3421
15 National Water Commission, ‘Ecological water requirements of groundwater systems: a knowledge and policy review’ (2011) ix (‘the science to inform the provision for groundwater-dependent ecological values is at an early stage in Australia in comparison with consideration of environmental flows in surface water management’).
shifts to drier and hotter conditions and the task of water managers becomes even more challenging.

Despite these implementation challenges, the concept of sustainable development – with its requirement to consider the developmental and environmental needs of future as well as present generations – offers enduring guidance on management philosophy and issues that should be addressed in setting allocation limits, and in groundwater planning more generally. It is arguably more important than ever under conditions that place additional pressure on groundwater resources, such as the shift to dryer climatic conditions experienced in the South West of Western Australia.

As we have noted, another very important groundwater management issue – and one which comes into sharper focus as water becomes more scarce – is how rights to extract water should be distributed. It is difficult, in this area, to identify any clear and broadly accepted policy objectives. In Australia, a tension has developed between concepts of ‘equitable’ and ‘efficient’ water allocations. The concept of ‘equitable’ allocations is a vague one, but is associated with democratic control over water allocation, exercised through fair decision-making processes.17 The concept of ‘efficient’ water allocations places greater emphasis on the economic utility of water use, and is associated with allocation through water markets. Australia’s Intergovernmental Agreement on a National Water Initiative places greater emphasis on the latter objective, while maintaining a role for government to set the rules for water allocation through statutory water plans.18

1.2 Legal models for groundwater management

There are many different legal models that can be used to govern groundwater use. These include:

- a ‘rule of capture’ model, under which landowners overlying a groundwater resource have unlimited rights to access that resource;19
- an ‘correlative rights’ model, under which landholders may pump as much as they like provided they put it to beneficial use and do not interfere with the ability of other landholders to do the same;20
- a ‘regulated access’ model, under which the state allocates rights to use groundwater through a licence or other instrument. 21

In Australia the historical common law ‘rule of capture’ model has been replaced by a statutory ‘regulated access’ model for most groundwater resources. A particular advantage of this model is that it can set caps on cumulative water use. If the regulatory system covers all significant water

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18 Council of Australian Governments, above n 9.
users, appropriate caps are set and water use is properly monitored and regulated, such a system provides a good basis to achieve sustainable management of groundwater resources.

As Dellapenna has noted, the ‘regulated access’ model also has the advantage, from a climate change adaptation perspective, of providing greater flexibility to adjust water use in a drying climate. While this is clearly correct, the degree to which water use can be adjusted is affected by the design of the particular regulatory framework (such as the design of the provisions concerning variation of water access rights), not to mention the social and political context in which that framework is used.

1.3 Western Australia’s regulatory framework

Definition of water resources

The Rights in Water and Irrigation Act 1914 (WA) (‘RIWI Act’) is the principal legislation governing groundwater management in Western Australia. Under the RIWI Act, ‘water resources’ are defined to include:

(a) water courses and wetlands together with their bed and banks;
(b) other surface waters; and
(c) aquifers and underground water.23

‘Aquifers’ is not defined in the Act, but ‘underground water’ and ‘underground water source’ is defined to include ‘water that percolates from the ground into a well or other works’.24

Objectives of water resource management

Part III of the RIWI Act deals with management of water resources. The objects of the Part are to:

- provide for the management of water resources, and in particular for
  - their sustainable use and development to meet the needs of current and future users; and
  - the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them;
- promote the orderly, equitable and efficient use of water resources;
- foster consultation with members of local communities; and
- assist the integration of the management of water resources with the management of other natural resources.25

The Minister, and other persons having functions under the Act such as delegates of the Minister, must seek to ensure that these objects are achieved.26

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22 Ibid. Dellapenna uses the term ‘regulated riparianism’ rather than ‘regulated access’. We have used the term ‘regulated access’ because ‘riparianism’ is less apposite in a groundwater context.
23 Rights in Water and Irrigation Act 1914 (WA) s2. Note that there is a different definition of ‘water resource’ in s26GB, which relates to the directions power.
24 Ibid.
25 Ibid s 4(1).
26 Ibid s 4(3).
Water resource planning, monitoring and review

Under provisions included in the *RIWI* Act in 2001, the Minister may make regional, sub-regional and local area management plans for the management of water resources. We won’t describe those planning provisions in any detail here, because they aren’t used in practice. Why is that? It may, in part, be due to the demands on departmental resources that would be associated with preparing three sets of management plans (regional, sub-regional and local). Another reason may be the statutory requirement for the Minister to seek advice from the Water Resources Council on a proposed plan. Despite the mandatory language of the *Water (Agencies) Powers Act 1984* (WA), this body has never been established.

The Department of Water has prepared a number of non-statutory plans, known as water allocation plans, which perform similar functions to the water resource management plans contemplated by the *RIWI* Act. These plans are developed with the benefit of public consultation and commonly set objectives, management measures and performance indicators. Some examples are provided in the following table.

**Table 1: Examples of provisions in South West groundwater allocation plans**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management measure</th>
<th>Performance indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain adequate groundwater levels to sustain the renewable capacity of the water resource</td>
<td>Allocation limits for total consumptive use set at less than estimated recharge</td>
<td>Change in groundwater levels</td>
</tr>
<tr>
<td>Prevent inland movement of seawater interface</td>
<td>Allocation limits for total consumptive use set at a level that will maintain groundwater flow to the sea. Abstraction near the coast to be limited. If seawater interface is found to be intermixing with an aquifer the Department may restrict coastal pumping</td>
<td>Movement of seawater interface</td>
</tr>
</tbody>
</table>

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28 *Rights in Water and Irrigation Act 1914* (WA), ss 26GW, 26GX, 26GY.

29 As we see below, non-statutory water allocation plans have generally been prepared in a ‘single layer’ rather than in a hierarchy of regional, sub-regional and local plans. Some non-statutory regional plans, with a broader focus than that contemplated by the *RIWI* Act, have also been developed: e.g. Department of Water, ‘Water planning for the South West Region 2010–2030’ (Government of Western Australia, 2010).


31 *Water (Agencies) Powers Act 1984* (WA) s 16 (‘The Minister is to appoint 6, 7 or 8 persons to be the members of a body called the Water Resources Council’). This provision was inserted by s107 of the *Water Resources Legislation Amendment Act 2007* (WA).

or require draw points to be moved.

| Protect groundwater-dependent ecosystems | Cumulative allocation limits for licensed abstraction, plus case-by-case assessment of licence applications for impacts on groundwater-dependent ecosystems | Minimum groundwater levels for environmentally significant sites |

As their name suggests, water allocation plans identify cumulative allocation limits for groundwater abstraction. The Department of Water’s publication ‘Water Allocation Planning in Western Australia: A Guide to our Process’ (‘Water Allocation Planning Guide’) states that before an allocation limit is set the Department will set environmental water requirements and assess the ‘resource yield’ – effectively the sustainable yield – needed to meet those requirements. In South West groundwater management areas this assessment is typically done using computer-based, numerical simulations. However, there is no requirement that non-statutory plans or associated methods reports contain this sustainable yield figure. Nor is there any requirement that the final allocation limit be consistent with the sustainable yield.35

As illustrated in the extract from the Arrowsmith Groundwater Allocation Plan at Appendix A, in practice a water allocation plan will identify:

- an allocation limit for total consumptive use for the relevant sub-area/aquifer;
- an estimate of unlicensed use;
- any water reserved as a source of future public water supply; and
- the remaining component available for licence allocation.

Non-statutory water allocation plans have been prepared for most areas with managed groundwater resources in the South West (see Appendix B).37

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34 A number of different groundwater models are used by the Department of Water in allocation planning. The principal models in our study area are the Perth Regional Aquifer Modelling System (PRAMS), which covers an area of about 10,000 km² between Mandurah in the south and Moora in the north; the Peel-Harvey Regional Aquifer Modelling System (PHRAMS) which covers an area of about 4095 km² between Peel Inlet and Bunbury; and the South West Aquifer Modelling System (SWAMS) which covers an area of about 8500 km² and the three main aquifers (Superficial, Leederville and Yarragadee) in the Southern Perth Basin: CSIRO, ‘Water yields and demands in south-west Western Australia: A report to the Australian Government from the CSIRO South-West Western Australia Sustainable Yields Project’ (CSIRO, 2009) 48.
35 Indeed, the Water Allocation Planning Guide makes clear that the ‘resource yield’ is a ‘baseline’ which can be adjusted, and that current and predicted future consumptive use is ‘a major deciding factor’ in how allocation limits are set: Department of Water, above n 33, 19, 24.
36 As discussed in the following section, some non-artesian groundwater is not regulated under the RIWI Act.
37 On the face of it, one notable omission is the lack of a management plan for the Jandakot area south of Perth, which contains ecologically-significant, groundwater-dependent systems. The explanation may lie in the fact that groundwater extraction in the Jandakot area was subject to environmental impact assessment under Part IV of the Environmental Protection Act 1986 (WA) and is governed by Ministerial Conditions imposed following that assessment.
The RIWI Act provides that regional, sub-regional and local area management plans must ‘specify the monitoring and reporting (which is to occur at least once in every 7 years) to be carried out by the Minister to ensure, as far as practicable, that the objects of this Part are achieved in the implementation of the plan’. The Water Allocation Planning Guide similarly requires non-statutory plans to set out a monitoring program. However, monitoring relates to resource management objectives and associated performance indicators specified in the plan, rather than the more general RIWI Act objectives.

In relation to reporting, the Water Allocation Planning Guide provides that a resource review and an evaluation statement should be published regularly, generally on an annual basis. The resource review is to include measurement and monitoring information, such as trends in water levels. The evaluation statement is to provide a brief summary of, among other things, performance against plan objectives and changes in allocation status (e.g. whether any areas have become over-allocated). In practice, evaluation statements for groundwater management areas in the South West have not been published annually (see Appendix C) and no resource reviews have been published.

Regulation of water access

When a licence is needed for groundwater abstraction
Subject to some exceptions, a person must be licensed to take water from an underground water source that is either:
- artesian underground water; or
- non-artesian groundwater in a proclaimed area or an area prescribed by regulations.

While no areas have been prescribed by regulation, groundwater management areas have been proclaimed throughout the South West, covering most of the groundwater resources of the area. Approximately 90 per cent of Western Australia’s groundwater resources are within proclaimed areas. To the extent that there are groundwater resources outside proclaimed areas, these tend to be isolated aquifers in fractured rocks. The use of these resources doesn’t raise the same issues of impacts on neighbours or the environment as groundwater resources in proclaimed areas.

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38 Rights in Water and Irrigation Act 1914 (WA) ss 26GW(3), 26GX(3), 26GY(3).
39 Department of Water, above n 33.
40 Ibid.
41 Ibid 4, 31.
42 Ibid 30.
43 Ibid.
44 Rights in Water and Irrigation Act 1914 (WA) s 5C(2)(c). ‘Artesian underground water’ is not defined, but ‘artesian well’ is defined ‘as a well, including all associated works, from which water flows, or has flowed, naturally to the surface’: s 3.
45 Ibid s 5C
48 Ibid.
A person does not need a licence to take non-artesian groundwater where an order to this effect has been approved by the Governor and published in the Government Gazette. Using this mechanism, exemptions have been provided for the following, which are as a result unlicensed uses:

- firefighting;
- watering cattle or other stock, other than those being raised under intensive conditions;
- watering an area of lawn or garden that does not exceed 0.2 hectares;
- other ordinary domestic uses;
- short term dewatering;
- taking of water for monitoring purposes.

These exemptions do not apply to artesian water. This means, for example, that a licence is currently required to take artesian water to water a lawn or for other domestic uses.

The RIWI Act provides a second mechanism for exemptions: the Minister may make local by-laws that authorise persons to take groundwater (including artesian water) for particular purposes or under particular circumstances. As at the date of writing, no such by-laws were in effect.

The Act also provides that a person does not need to obtain a licence to take water where water is taken ‘under and in accordance with ... a right conferred by another written law’. This exception does not appear to have any substantial effect in practice. For example, a mining company wishing to ‘dewater’ to give it access to a mineral will need to obtain a licence under the RIWI Act, notwithstanding the fact that mining and associated dewatering has been approved under the Mining Act 1978 (WA), or a State Agreement Act.

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49 Rights in Water and Irrigation Act 1914 (WA) s 26C.
50 Western Australia, Government Gazette, No 132, 8 July 2011, 2902.
51 Ibid.
52 Ibid.
53 Ibid.
54 Western Australia, Government Gazette, No 29, 4 March 2011, 702. There are a number of criteria that need to be met for the exception to apply, including that the dewatering the water is taken at a pump rate not exceeding ten litres per second over a period of less than 30 consecutive days.
55 Western Australia, Government Gazette, No 43, 16 March 2012, 1274.
56 Rights in Water and Irrigation Act 1914 (WA) s 26L(3)(c), s 5C(1)(c)(ii).
58 Rights in Water and Irrigation Act 1914 (WA) s 5C(1)(c)(ii).
59 While the statutory provisions are not entirely clear, the better view is that a mining tenement cannot preclude the need for a licence under the Rights and Water and Irrigation Act 1914: see Alex Gardner, ‘Mining Access to Water Resources - Traditions and Developing Principles’ (Paper presented at the AMPLA, Thirty-Seventh National Conference, Adelaide, South Australia, 2013) 6ff; M Crommelin and R Hunder, 'Water and Mining - Controls in Conflict' (1989) Australian Mining and Petroleum Law Association Yearbook 201; Katie Winterbourne, 'Obtaining Access to Water for Mining Purposes in Western Australia' (1997) 16 Australian Mining and Petroleum Law Journal 166. In any case this issue does not arise in practice because the Department of Mines and Petroleum imposes a standard condition on mining tenements stating that ‘the abstraction of groundwater is prohibited unless a current licence to construct/alter a well and a licence to take groundwater has been issued by the [Department of Water]': see Department of Water and Department of Mines and Petroleum, 'Administrative Agreement Between the Department of Mines and Petroleum and the Department of Water for Mineral Exploration and Mining Operations in Water Resources Areas in Western Australia' (2012), 16.
There are native title rights to water under the common law and the *Native Title Act 1993* (Cth).\(^{61}\) The status of native title is currently undetermined in the South West.

Importantly, the *RIWI Act* regulates the ‘taking’ of water from groundwater sources. This term probably does not extend, and in practice has not been treated as extending, to the use of groundwater by plantations. It is, however, treated as extending to the use of a dam that intercepts a water table.

The penalty for taking water without a licence, or for breaching a condition of a licence, is a fine of up to $10,000 ($50,000 for corporations) plus a daily penalty of up to $1,000 ($5,000 for corporations).\(^{62}\)

**Figure 2: When is a licence required to take groundwater?**

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60 For example, dewatering activities form part of proposals approved by the Minister for State Development under the *Collie Coal (Western Collieries) Agreement Act 1979* (WA) and the *Collie Coal (Griffin) Agreement Act 1979* (WA), but the companies concerned have nevertheless obtained licenses under s5C of the *Rights in Water and Irrigation Act 1914*: per comm, Andrew Cresswell, Department of Water, 25 November 2013. Of course, the fact that an approval has been given under a State Agreement Act makes it very unlikely that a licence would be refused.

61 Gardner, Bartlett and Gray, above n 19, Chapter 13.

62 *Rights in Water and Irrigation Act 1914* (WA) s 5C(1); *Sentencing Act 1995* (WA) ss 9, s 40(5).
**Nature of water access rights**

A licence may authorise the taking of water for a fixed period or an indefinite duration. In practice, licences specify an annual volumetric water entitlement and are usually issued for up to 10 years. During the term of the licence, the licence-holder may take water as long as this is done in a manner consistent with any terms, conditions or restrictions on the licence.

**Table 2: Common conditions on groundwater licences in the South West**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering</td>
<td>‘The licensee must install an approved meter to each water draw-point through which water is taken under this licence’</td>
</tr>
<tr>
<td>Monitoring</td>
<td>‘The licensee must take and record the reading from each meter required under this licence at the beginning and another at the end of the water year defined on this licence.’</td>
</tr>
<tr>
<td>Reporting</td>
<td>‘Every [specified period] the licensee shall provide to the Department of Water a Groundwater Monitoring Summary for the preceding water year. The first report is due [specified date].’</td>
</tr>
<tr>
<td>Salinity</td>
<td>‘No water may be taken from any well where the salinity level is greater than [amount] millisiemens per meter measured at 25 degrees Celsius.’</td>
</tr>
<tr>
<td>Operating Strategy</td>
<td>‘The licensee shall comply with the commitments of the operating strategy [name], as prepared by [name] and approved by the Department of Water on [date] including any modifications to the commitments as approved during the term of the licence.’</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Licence conditions may also impose water efficiency requirements, either directly (e.g. by requiring a golf course to only use sprinklers before 9am or after 6pm) or by requiring the preparation of a ‘water conservation/efficiency plan’ as part of its operating strategy.</td>
</tr>
</tbody>
</table>

There are a number of ways in which a licence-holder may be prevented from taking the full amount of the annual volumetric water entitlement specified in a licence:

- **Conditions on a RIWI Act licence** may restrict the taking of water. For example, as noted above a condition on a licence may provide that no water may be taken from a well where salinity exceeds a specified concentration.
- **Other laws** may restrict the taking of water. For example:
  - abstraction proposals with significant environmental impacts may be assessed under the *Environmental Protection Act 1986* (WA) and subject to conditions that restrict...
abstraction – for example by requiring pumping to be modified if wetland water levels fall below a specified level;\textsuperscript{67}

- abstraction proposals that may affect Ramsar Wetlands or nationally-threatened species or ecological communities may be assessed under Environment Protection and Biodiversity Conservation Act 1999 (Cth) and subject to conditions that restrict abstraction;\textsuperscript{68}
  - the Contaminated Sites Act 2003 (WA) may prevent abstraction of groundwater on a site that has been classified as contaminated;\textsuperscript{69}

- The Minister (or departmental delegate) may, by notice in writing, give a direction to a person restricting the amount of water the person may take from a water resource. Such a direction may be issued where the Minister has determined that the quantity of water in a water resource is, or is likely to be, insufficient to meet demand, including any demand made by the needs of the environment; or where the Minister has made, and published in the Gazette, an order declaring that a water shortage exists in the area in which the water resource is situated.\textsuperscript{70}

- The licence may be amended to reduce the annual volume of water available under the entitlement. Under the RIWI Act the Minister (or departmental delegate) may vary any term, condition or restriction in a licence on a broad range of grounds, including to protect the water resource or the associated environment from unacceptable damage, or to prevent a serious inconsistency arising with a water allocation plan approved under the Act.\textsuperscript{71}

It is only under the last of these scenarios that compensation may be payable. Under complex compensation provisions inserted in the RIWI Act in 2001, a person may have a right to compensation where they suffer damage as a result of a licence amendment, suspension or cancellation (but not as a result of a refusal to renew a licence). It is clear that, under these provisions, compensation is not available where a licence is amended to recoup unused water entitlements\textsuperscript{72} and that compensation may be available in most other cases, such as where a volumetric water entitlement is reduced to protect the water resource or the associated

\textsuperscript{67} For an example of the latter, see the conditions that originally applied to the Water Authority on its proposal to abstract water from the Jandakot Mound: Minister for the Environment, Statement that a Proposal May be Implemented (Pursuant to the Provisions of the Environmental Protection Act 1986) (Ministerial Statement 253, 29 April 1992), Condition 1 and Summary of Environmental Management Commitments.

\textsuperscript{68} For an example of an abstraction proposal in the South West that was assessed under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) see: Australian Government, Approval: Bemax Resources Titanium Mineral Mining Project, Wonnerup, WA (EPBC 2010/5403), condition 13 (proponent required to prepare and comply with a water management plan).

\textsuperscript{69} For example, some residential land in Perth has been classified as ‘contaminated – restricted use’ because of concentrations in the heavy metals and acidity concentrations in the groundwater beneath that land. Groundwater abstraction is not permitted at those sites. See Department of Environment Regulation, Contaminated Sites Database, <https://secure.dec.wa.gov.au/idelve/css/> (search suburb of Gwelup).

\textsuperscript{70} Rights in Water and Irrigation Act 1914 (WA) s 26GD.

\textsuperscript{71} Ibid sch 1, cl 34. In practice this power has not exercised on these broad grounds; its use has been confined to cases in which licence holders have consistently failed to use their full water entitlement.

\textsuperscript{72} Rights in Water and Irrigation Act 1914 (WA) cl 39(1) does not refer to cl 24(2)(d), which empowers the Minister (or delegate) to amend a licence where the quantity of water that may be taken under the licence has consistently not been taken.
environment, or for consistency with an approved water resource management plan. However, the right to compensation is so heavily qualified with exceptions that it has very little practical application. There are two important exemptions:

- In all cases, compensation is only available if the licence holder’s use of water is consistent with the objects of the Act. This arguably means that no compensation is payable where entitlements are reduced to return water use to sustainable levels, given that one of the objects of the Act is sustainable water use.

- In most cases, compensation will not be available unless ‘the effect of the exercise of the power on the person is permanent’ and ‘the Minister is of the opinion that the effect of the exercise of the power on the person is not fair and reasonable having regard to the exercise of the power in respect of other licence holders in the surrounding area’.

**Allocation of water access rights**

Water licences are not fully ‘unbundled’ from land in Western Australia. In order to hold a licence, a person must ordinarily be an owner or occupier of the land to which the licence relates, or have the agreement of the owner and occupier to be on the land and do the things that may be done under the licence.

A person that meets these eligibility requirements may apply for a licence to take groundwater. There is no application fee. The Department, in considering an application for a licence, must have regard to all matters it considers relevant, including whether the proposed taking and use of water:

- are in the public interest
- are ecologically sustainable
- are environmentally acceptable
- may prejudice other current and future needs for water
- would have a detrimental effect on another person
- could be provided for by another source
- are in keeping with
  - local practice
  - a relevant local by-law
  - a water allocation plan approved under the Act
  - relevant previous licensing decisions
- are consistent with
  - land use planning instruments
  - the requirements and policies of other government agencies

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72 Ibid cl 39(1), 24(2), 25(2).
74 Ibid s 4. This would be consistent with the statement in the Second Reading speech for the Amendment Bill that no compensation is payable for ‘changes that are necessary to reduce excessive use to sustainable levels’: Western Australia, *Parliamentary Debates*, Legislative Assembly, 1 July 1999, 9338 (Dr Kim Hames, Minister for Water Resources).
75 Ibid sch , cl 39(5)(b). This exception does not apply where the amendment to the licence is made on public interest grounds.
76 *Rights in Water and Irrigation Act 1914* (WA) sch 1, cl 3. Public authorities with powers under a written law in relation to water on or under any land, but whose powers are exercisable in accordance with a licence, are also eligible to hold a licence: Ibid. An exception is also made for persons prescribed in local by-laws, but no such by-laws have been made.
any intergovernmental agreement or arrangement.77

Two points should be made about how these considerations are applied in practice.

First, while allocation limits are an important consideration, it can by no means be assumed that an application will be granted in areas where water is available. A proposal may be rejected because of its impacts on the water resource, other users or the environment, even if the volume of water to be taken is within the relevant allocation limit for consumptive use. For significant applications, the Department may require the applicant to provide a hydrogeological report considering these issues before a decision is made on the application.78

Secondly, the reference to ‘current and future needs for water’ is used to support a policy of ‘reserving’ water for future public supply. Non-statutory plans commonly identify a volume of water that is reserved for this purpose: see Appendix A for an example of this. A licence will ordinarily be refused if it would involve accessing this reserved water, but if this water is not immediately required for public water supply temporary licences may be issued for other purposes.79

Subject to satisfying the considerations listed above, a licence will be granted on a ‘first in – first served’ basis. There is a provision in the RIWI Act that may, with supporting regulations, provide the basis for the sale of licences,80 but this provision has never been used. Apart from the costs to the applicant of preparing its licence application and abstracting the water, groundwater (and surface water) is free.

Trade in water access rights
Under amendments to the Act that came into effect in 2001 there are currently three ways to trade water.

- First, a licence may be permanently transferred to another person.81 This mechanism is intended for use where water is to be taken from the same location: for example, where there has been a change in land ownership.82 The transfer is recorded by the Minister endorsing the name of the transferee on the licence.83

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77 Rights in Water and Irrigation Act 1914 (WA) sch 1, cl 7(2).
78 Ibid sch 1, cl 5(2) (power to require applicant to provide information); Department of Water, ‘Operational Policy 5.12 - Hydrogeological Reporting Associated with a Groundwater Well Licence’ (2009), 8 (the Department will determine whether a hydrogeological assessment is required having regard to the volume and pumping regime requested, level of use in groundwater management area, potential impacts upon other users, potential impacts upon groundwater-dependent ecosystems and existing salinity of the groundwater resource).
80 Rights in Water and Irrigation Act 1914 (WA) Sch 1 cl 40; see also Government of Western Australia, ‘Clause Notes to the Rights in Water and Irrigation Act 1914 (WA)’ (1999)106. As discussed in Chapter 7, there are some drafting issues with this clause which may mean that it would not support the auction of water licenses.
81 Rights in Water and Irrigation Act 1914 (WA) sch 1, cl 29(1)(a).
83 Rights in Water and Irrigation Act 1914 (WA) sch 1, cl 36(a).
Second, a licensee may enter into an agreement with a third party relating to the taking of water under the licence by the third party for a limited period of time. The Minister formalises this ‘water lease’ by recording on the licence the period of the agreement, the name of the third party and such other particulars as the Minister thinks fit.

Third, a water entitlement – that is, the quantity of water that a licensee is entitled to take under a licence – may be transferred to another person who holds, or is eligible to hold, a licence. This mechanism may be used, for example, where one landowner in a fully allocated groundwater management sub-area wants to purchase part of the water entitlement of another landowner in that sub-area. If the other person already has a licence the transfer is formalised by amending the transferring and receiving licence (e.g. by reducing the volumetric water entitlement by 50ML/yr on one licence and increasing it by 50ML/yr on the other). If the other person does not yet have a licence one will be issued and endorsed by the Minister with particulars of the transfer.

As with the initial allocation of water a water trader must ordinarily be the owner or occupier of land from which the water is to be taken, or have the agreement of that person to be on the land and do there the things that may be done under the licence. This requirement was included in the Act to prevent the speculative acquisition of water rights.

Controls on unlicensed water use

The RIWI Act licensing scheme is the principal means by which groundwater use is regulated in Western Australia. However, basic regulatory controls do apply to some unlicensed groundwater use. These controls do not impose volumetric limits on the amount of water that can be taken, but they do restrict how water is used.

Under the Water Agencies (Powers) Act 1984 (WA) by-laws may ‘prohibit, impose restrictions on or otherwise regulate the use of water’. Offences created under such by-laws may carry a maximum penalty of $2000 ($10,000 for corporations), with an additional penalty of up to $200 per day ($1,000 for corporations) for continuing offences.

Pursuant to these provisions, the Water Agencies (Powers) By-Laws 2010 impose restrictions on the use of groundwater from unlicensed ‘domestic bores’. A ‘domestic bore’ is defined as ‘a non-artesian well ... from which the only water that can be taken is from the water table aquifer’.

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84 Ibid sch 1 cl 30.
85 Ibid sch 1 cl 36 (d). The Act does not use the term ‘water lease’ – it is used in this paper as a shorthand description.
86 Ibid sch 1 cl 28.
87 Above n 82.
88 Rights in Water and Irrigation Act 1914 (WA) sch 1 cl 36(b).
89 Ibid sch 1 cl 29, 3(d).
90 Government of Western Australia, above n 80, 79 (‘The list of people eligible to hold licenses has been carefully drafted to avoid speculation in licences once trading has been introduced’).
92 Ibid s 36(4)(b); Sentencing Act 1995 (WA) ss 9, s 40(5).
93 Water Agencies (Powers) By-Laws 2010 (WA) cl 10 (exemption for licensed water use).
94 Ibid cl 3.
The by-laws contain seven stages of water restrictions. Stage one water restrictions impose modest constraints on the watering of lawns, gardens and sporting grounds. Reticulated watering is restricted to once a day, in either the morning or evening. At the other extreme, stage seven water restrictions prohibit watering of lawns, gardens and sporting grounds except by handheld watering can. The use of water in other activities, such as the use of high pressure water cleaners, the filling of swimming pools and the washing of motor vehicles is also prohibited or severely restricted.

Clearly, the intent of the by-laws is to establish a flexible framework under which watering practices can be modified in the light of changing conditions. At present under the by-laws, different levels of restrictions apply in different areas of the State. For Perth and Mandurah, watering of lawns, gardens or sporting grounds is prohibited in the winter months of June, July and August. In the other months reticulated watering is limited to the morning or evening period three times per week.

The maximum penalty for a breach of the by-laws is $500 for natural persons and $2,500 for corporations.

1.4 Water law reform in Western Australia

The RIWI Act was subject to its last round of major amendments in 2001. Since that time there have been a number of developments in national and state policy.

One major development has been the Intergovernmental Agreement on a National Initiative, which was signed by most States and Territories in 2004 and by Western Australia in 2006. Among other things, the agreement includes commitments to:

- statutory water planning directed at achieving environmentally-sustainable levels of extraction;
- returning over-allocated and over-used water resources to sustainable levels of abstraction;
- secure, statutory provision for environmental and other public benefit outcomes;
- establishing a new system of water entitlements that gives the holder of the entitlement a perpetual share of a consumptive pool and identifies a ‘risk assignment framework’ for changes in that consumptive pool;
- increased use of market-based mechanisms for the release of water entitlements; and
- reduced barriers to trade of water entitlements.

In 2006, a report by the Water Reform Implementation Committee, entitled ‘A Blueprint for Water Reform in Western Australia’ broadly endorsed the National Water Initiative reform program, with a

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95 Ibid sch 2, Item 1.
96 Ibid sch 2 item 7.
97 Ibid cl 4; Sentencing Act 1995 (WA) ss 9, s 40(5).
98 Rights in Water and Irrigation Amendment Act 2000 (WA), which came into effect on Act 10 January 2001 (see Western Australia, Government Gazette, 10 January 2001, 163).
99 Council of Australian Governments, above n 9.
particular emphasis on reform of water entitlements and increased water trading.\textsuperscript{100} The State Government accepted these recommendations, with some refinements, in 2007.

In late 2009 a new State Government released a Discussion Paper with a detailed set of reform proposals that were largely consistent with the National Water Initiative (’NWI’) commitments outlined above.\textsuperscript{101} Policy development slowed from this point, but in September 2013 the Government released a Position Paper on reforming water resource management (’2013 Position Paper’) with a similar set of reform proposals,\textsuperscript{102} with a view to drafting new water resource management legislation in 2014.\textsuperscript{103}

One of the purposes of this Report is to inform the development of, and debate on, this proposed legislation and subsidiary legislation that will follow. Reform proposals in the 2013 Position Paper are discussed in subsequent chapters of the Report.

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\textsuperscript{100} Water Reform Implementation Committee, ’A Blueprint for Water Reform in Western Australia: Final Advice to the Western Australian Government’ (2006).
\textsuperscript{102} Department of Water, above n 64.
2. Groundwater challenges in a drying South West

2.1 Water resources of the South West

For the purposes of this paper, the South West of Western Australia is the area identified in Figure 1, stretching from Geraldton in the north to Albany in the south. It covers some 62,500 km² and contains around 2 million people - 90 per cent of the population of Western Australia.\(^{104}\)

Groundwater is the most important source for consumptive use in the South West. In 2009, groundwater use in the South West was estimated to be 850 gigalitres per year (GL/yr), which was at that time about three quarters of all water used.\(^{105}\) The main uses are for drinking water supplies in Perth and towns, and self-supply for the irrigation of public and private lawns and gardens, horticulturalists, industry and commerce.\(^{106}\) Self-supply from groundwater is very significant. We have not yet obtained exact figures, but estimate that self-supply from groundwater is in the order of 700GL/yr. This compares, for example, to approximately 350GL/yr of public water supply in the South West sourced from surface, desalinated water and groundwater.

Alongside these consumptive uses, the South West’s water resources also support areas of great environmental significance. The South West of Western Australia has been identified as one of 25 global ‘biodiversity hotspots’.\(^{107}\) It includes four wetlands listed as internationally significant under the Ramsar Convention,\(^{108}\) other conservation category wetlands and areas containing nationally-listed threatened species and ecological communities that are dependent on groundwater flows for their survival.\(^{109}\) Many groundwater-dependent systems are also socially significant - the Blackwood River is one example.\(^{110}\)

2.2 The drying trend and its impacts on water resources

The drying trend

Since 1970 there has been a 17 per cent decline in average winter rainfall in the southwest of Australia.\(^{111}\) There have also been less of the ‘wet’ winters that normally replenish reservoirs, superficial aquifers and wetlands after they have been drawn down in drier years.\(^{112}\)

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\(^{104}\) CSIRO, above n 34, iv.
\(^{105}\) Ibid.
\(^{106}\) Ibid vi.
\(^{112}\) Sadler, above n 1; CSIRO and Bureau of Meteorology, above n, 6.
The role of human-induced climate change

Peer-reviewed scientific papers have explored a number of possible causes for reduced rainfall in South West Western Australia, including land-cover change\textsuperscript{116}, multi-decadal variations\textsuperscript{117} and


\textsuperscript{114} Ibid.

\textsuperscript{115} Ibid.


\textsuperscript{117} Wenju Cai and Je Shi, 'Multidecadal fluctuations of winter rainfall over southwest Western Australia simulated in the CSIRO Mark 3 coupled model' (2005) 32(12) Geophysical Research Letters
human-induced climate change. One study suggests that human-induced climate change contributes to about 50% of the observed rainfall decline.

In its 2012 brief to policy makers, the Indian Ocean Climate Initiative (a joint initiative of the WA Government, CSIRO and the Bureau of Meteorology) outlined the results of its research into the relationship between a warming atmosphere, a reduced temperature gradient between the equator and the South Pole, changes in atmospheric circulation and rainfall reductions in South West Western Australia. The brief concluded that ‘[t]he observed patterns of large-scale atmospheric change associated with SWWA rainfall reductions are consistent with what would be expected in an atmosphere influenced by increasing greenhouse gas concentrations.’

The recently-released report by the Intergovernmental Panel on Climate Change entitled *Climate Change 2013: The Physical Science Basis* does not express a view on the extent to which human-induced climate change has contributed to reduced South West rainfall, simply noting the reduction and peer-reviewed papers that have identified possible contributing causes, including anthropogenic climate change.

**Impacts on surface water resources**

Because streamflow only occurs once a soil saturation threshold is reached, reduced rainfall has a substantial impact on streamflow. Since the mid-1970s average streamflow into the major water supply reservoirs in the South West has declined by more than 50 per cent.

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119 Cai and Cowan, above n 118.

120 Indian Ocean Climate Initiative, 'Indian Ocean Climate Initiative Stage 3: Summary for Policymakers' (CSIRO and BoM, 2012) 9-10.


Public water supply response to reduced streamflow

While not the focus of this research, mention does need to be made of the public water supply response to the collapse in streamflow experienced since the mid-1970s. This response provides important context, as it had significant implications for groundwater management. We focus here on the response for Perth and other areas serviced by the Integrated Water Supply System – both because this is the largest public water supply system in the South West, and because of the important implications this has for groundwater demand in the South West.

Ever since C Y O’Connor’s ‘golden pipeline’ succeeded in moving water from the Perth Hills to the Goldfields, big water engineering projects have had a hold on the Western Australian imagination. When Perth’s dams themselves became unreliable due to reduced streamflow from the mid-1970s, the State Government turned to engineering solutions again, but this time the water source was closer to home. In the 1960s the Public Works Department had identified extensive groundwater stocks within two superficial aquifers: the Gnangara Mound, located north of Perth’s Swan River; and the Jandakot Mound, located to the south of the Swan River. The timing of this discovery and the location of these groundwater resources was fortuitous. As Morgan

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125 During the 1890s gold rush a water shortage developed in the Goldfields east of Perth. In a substantial engineering feat for the time, the solution was the 560km ‘Golden Pipeline’, opened in 1903, to move water from Perth’s Mundaring Weir Dam to Kalgoorlie: Godfrey Lowe, ‘The Golden Pipeline’ (2004) 2(1) Australian Journal of Multi-disciplinary Engineering 45.
has noted ‘this subterranean treasure trove was almost exactly aligned with the coastal ribbon of Perth’s post-water development.’

The use of groundwater for public water supply sharply increased over following decades: initially from the superficial Gnangara and Jandakot aquifers, but later – as water levels in the superficial aquifers declined - from the deeper, more confined Leederville and Yarragadee aquifers. By 1998 the Water Corporation was using oil-field technology to draw water more than one kilometre from the Yarragadee aquifer beneath Perth and by 2001 a national assessment of water resources found that the Leederville and Yarragadee aquifers were fully allocated in the Perth area.

Figure 7: Water sources for the Integrated Water Supply System (1940-2023)

What would the next water source be? Abstraction from the South West Yarragadee aquifer south of Perth was considered, but rejected due to community concerns about the impacts on the South West economy and environment – concerns that were heightened by the experience of declining water levels on the Gnangara Mound. A 3,700km canal to bring water from Kimberley’s Fitzroy River was proposed, but was too costly and impractical. The eventual solution was seawater desalination. Two desalination plants were opened, in Kwinana (2006) and Binningup (2011).

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127 Ibid 164.
130 This graphic was kindly provided by the Water Corporation for this research project (24 July 2013).
131 Morgan, above n 126, 269-271.
133 Morgan, above n 126, 278, 281.
and by 2013 the Binnungup plant had been expanded to double its capacity. These desalination plants have the capacity to provide 150 GL/yr – about half of Perth’s annual water needs.

The latest major addition to the portfolio of water sources is treated wastewater. In 2013, following a successful three year trial, the State Government announced that ‘groundwater replenishment’, involving the injection of treated wastewater into aquifers and a corresponding increase in groundwater abstraction, would become an ongoing water source, initially supplying 7 GL/yr. This managed aquifer recharge project, which has the advantage of using significantly less energy than seawater desalination, has received bipartisan political support and is likely to become an increasingly important water source.

The engineering solutions of groundwater extraction, desalination and managed aquifer recharge are not the whole story. Substantial volumes of water have been saved through demand management measures including garden sprinkler restrictions and water use efficiency programs, and a water trade with South West irrigators was a timely addition to public water supply. It is undoubtedly the case, however, that rapid development of groundwater sources and desalination have been the main reason that public water supply has been able to continue at close to ‘business as usual’ levels alongside such a substantial decline in streamflow. Without the good planning combined with the good fortune of groundwater sources, a coastal location suitable for desalination and the billions of dollars needed to develop these water sources, Perth’s water story could have been very different.

There is one more important point about water source development for present purposes: that climate change projections have played an important role in water supply planning for more than three decades. In a controversial decision at the time, water supply plans were amended in the late 1980s on the assumption that climate change would see continued declines in rainfall in the South West. Water supply planning proceeded on the basis that dryer conditions were the ‘new normal’ rather than a temporary anomaly. As Morgan discusses in her careful analysis of the role climate change projections played in water supply planning in this period, the Water Authority of WA decided to adopt a precautionary approach in the face of tentative projections of a drying South West. After all, ‘if the WAWA invested in infrastructure for lower winter rainfall but the predictions were not fulfilled, the consequences would be less disastrous than if they had invested for higher winter rainfall and received less.’ This precautionary approach influenced both the timing of water source development and the preference for rainfall-independent water sources such as

As we shall see in the next chapter, climate change projections were not incorporated so rapidly into groundwater allocation planning.

Impacts of the drying South West on groundwater resources

The impact of reduced rainfall on groundwater resources has been significant. There has been a direct impact through reduced recharge to aquifers. For example, it has been estimated that reduced rainfall between 1979 and 2005 was responsible for falls of up to 4 metres in the important Gnangara superficial aquifer north of Perth. There has also been an indirect impact through increased demand for groundwater, both from the Water Corporation for public water supply and from private users of groundwater bores, to fill the gap left by declining streamflow. Taken together, reduced recharge and increased abstraction have had a significant effect on groundwater resources. Two important examples in the Perth region are the depletion of the superficial Gnangara Mound (Figure 8) and the deeper Yarragadee aquifer (Figure 9).

Figure 8: Gnangara Mound (superficial aquifer) depletion (1979-2009)

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139 Desalination is often referred to as ‘climate-independent’, but given the heavy energy use associated with desalination ‘rainfall-independent’ may be more appropriate, particularly for the first desalination plant which lacked effective carbon-offsetting arrangements. On the latter point, see Auditor General for Western Australia, ‘Renewable Energy: Knowing What We Are Getting’ (Report 12, 2007) 21 (‘the contractual arrangement to power the desalination plant does not ensure that additional renewable energy is generated’).

140 Cahit Yesertner, ‘Assessment of the declining groundwater levels in the Gnangara Groundwater Mound’ (Department of Water, 2008), p v.


It needs to be appreciated, however, that rainfall is not the only factor that affects recharge of groundwater aquifers: the amount of surface vegetation, for example, is another very important factor. In some cleared areas the effect of reduced rainfall has been a slowing of the rate at which the water table has risen, rather than a decline in the water table. As a result, watertable trends in recent decades present a mixed picture, with reductions in some areas and increases in others.

Figure 10: Water table trend in the southern Perth Basin (1980-2007)\textsuperscript{145}

Over-allocation and over-use in the South West

According to the Intergovernmental Agreement on a National Water Initiative (‘NWI’) a resource is *over-allocated* when ‘the total volume of water able to be extracted by entitlement holders at a given time exceeds the environmentally sustainable level of extraction for that system’. 146 A resource is *over-used* ‘where the total volume of water actually extracted for consumptive use in a particular system at a given time exceeds the environmentally sustainable level of extraction for that system.’ 147 So the first term relates to authorised abstraction; the second actual extraction; and in both cases the ‘environmentally sustainable level of extraction’ is the baseline against which over-allocation or over-use is to be measured.

How *over-allocated* are groundwater resources in the South West? This is a difficult question to answer in a way that is strictly consistent with the NWI definitions, because the formal allocation limit does not necessarily represent an ‘environmentally sustainable level of extraction’. 148 However a comparison of total licenced use with existing allocation limits does provide some basis for assessment. Table 4 provides an overview comparison, and Appendix E a detailed breakdown of over-allocated groundwater resources.

**Table 3: Recognised over-allocation in South West groundwater management areas (2014)**

<table>
<thead>
<tr>
<th>Plan area</th>
<th>Number of over-allocated management units</th>
<th>Total number of management units</th>
<th>Percentage of management units over-allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gnangara</td>
<td>27</td>
<td>84</td>
<td>32%</td>
</tr>
<tr>
<td>Cockburn</td>
<td>2</td>
<td>7</td>
<td>29%</td>
</tr>
<tr>
<td>Upper Collie</td>
<td>3</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>South West</td>
<td>9</td>
<td>60</td>
<td>15%</td>
</tr>
<tr>
<td>Gingin</td>
<td>5</td>
<td>40</td>
<td>12%</td>
</tr>
<tr>
<td>Rockingham-Stakehill</td>
<td>1</td>
<td>8</td>
<td>12%</td>
</tr>
<tr>
<td>Murray</td>
<td>1</td>
<td>20</td>
<td>5%</td>
</tr>
<tr>
<td>Arrowsmith, Jurien</td>
<td>0</td>
<td>79</td>
<td>0%</td>
</tr>
</tbody>
</table>

How *over-used* are groundwater resources in the South West? This is an even more difficult question to answer, as it requires an assessment of actual use. Unfortunately, there are only a few water resources in the South West that have sufficient metering coverage to enable an assessment of over-use. One of these is the Gnangara groundwater area, where sampling of government-owned bores suggests that total metered abstraction is less than total licenced

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146 Council of Australian Governments, above n 9, Sch B(i).
147 Ibid.
148 See p6 above.
abstraction. This provides some comfort that, for Gnangara at least, over-use is less extensive than over-allocation.

What is clear is that there are significant over-allocation problems, and likely over-use problems, for some South West groundwater resources. The drying South West climate has been a contributing factor. For example, some management units in the Gnangara system became classified as over-allocated in 2009 when allocation limits (but not licensed entitlements) were reduced to reflect reductions in groundwater recharge. This is a clear example of how over-allocation can come about in a drying climate: allocation limits that are based on out-dated assumptions of rainfall and recharge can, when adjusted downwards, mean that total licenced entitlements exceed the adjusted allocation limit.

### 2.3 Future scenarios for groundwater in the South West

Climate change will affect precipitation patterns differently in different parts of the world. The scientific evidence suggests that the South West of Western Australia is likely to continue to experience a drying trend. The Indian Ocean Climate Initiative has stated that:

IOCI3 modelling work indicates that as greenhouse gas concentrations continue to increase the large-scale changes to the atmosphere observed during the second half of the 20th century … could continue during the 21st century... Decreases in rainfall are projected for SWWA in all months of the May to October half-year. In some months these reductions could exceed 20 millimetres. These reductions may be as large as, or larger than, those experienced at the end of the 20th century.

These conclusions are consistent with a broad range of climate change models and with the conclusion of the 2013 Intergovernmental Panel on Climate Change report that ‘it is likely that cool season precipitation will decrease over southern Australia.’

What are the implications of climate change projections for the groundwater resources of the South West? In 2009 the CSIRO completed a major study that considered this question. The study took into account climate change scenarios, groundwater models and estimates of future demand. The CSIRO concluded that:

- average surface water yields could be 24 per cent lower by 2030;

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149 A sample of government-owned bores in 2009-10 showed that metered abstraction was 63% of licenced abstraction; a sample in 2010-11 (including the very dry winter of 2010) showed that metered abstraction was 87% of licenced abstraction: Department of Water, above n 144, 10-11.

150 In 2005 allocation limits across the Gnangara system, as recorded in the Department of Water’s Water Resource Licensing Database, added up to 337 GL. In 2009 allocation limits were revised in order to better reflect recharge from rainfall. Total allocation limits were reduced to 304GL and 21 management sub-areas became classified as over-allocated. In 2013 allocation limits were reduced further, but no additional sub-areas were classified as over-allocated as a result: pers comm Trudy Evans, Department of Water, 14 August 2013. Department of Water, above n 32, 37 (acknowledging that there is a need to reduce abstraction ‘towards a level that better reflects the current recharge from rainfall.’)

151 Stocker et al, above n 121, 91.

152 Indian Ocean Climate Initiative, above n 120, 26

153 CSIRO, above n 34, 3 (‘Almost all global climate models (GCMs) used by the Intergovernmental Panel on Climate Change (IPCC) predict that SWWA will experience an even warmer and drier future.’)

154 Stocker et al, above n 121, 1275.
• average groundwater yields could be a more modest 2 to 7 per cent lower on average but there would be substantial regional variations - yield declines may be greater than one-third in the Gnangara, Blackwood and Albany groundwater areas;
• water demand in the South West is projected to increase by about 35 per cent to 2030;
• the greatest deficits between future groundwater demands and groundwater yields are expected to develop in the areas around Perth and Albany.\textsuperscript{155}

Figure 11: Projected water table trend in the southern Perth Basin (CSIRO mid-range scenario)\textsuperscript{156}

It is important to appreciate that considerable climate change impacts are already ‘locked in’ – that is, even if effective international action is taken to stabilise greenhouse gas emissions this is likely to take several decades, and even if stabilisation is achieved it would take several centuries to fully reverse the drying trend.\textsuperscript{157} While not detracting from the need to reduce greenhouse gas emissions, this does highlight the importance for groundwater managers and groundwater regulation to be able to respond to the impacts of climate change.

\textsuperscript{155} CSIRO, above n 34, iv.
\textsuperscript{156} Ibid 51.
\textsuperscript{157} Wenju Cai, Peter Whetton and David Karoly, ‘The Response of the Antarctic Oscillation to Increasing and Stabilized Atmospheric CO2’ (2003) 16 Journal of Climate 1525
3. Overview of regulatory issues and reforms

In this Report we seek to address the following fundamental questions for groundwater management and regulation:

- How can groundwater use be maintained within sustainable limits in a drying climate, and how can groundwater be used productively and efficiently within these limits?
- What role does the regulatory framework for groundwater management have in achieving these goals?

This Report addresses these questions by examining the response by Western Australian groundwater managers to the drying South West, and the role of the regulatory framework in shaping this response. We consider, through a number of case studies, how the regulatory framework has coped with the ‘stress test’ of reduced rainfall since 1970, and whether other regulatory approaches could work better.\(^{158}\)

Chapters 4, 5 and 6 focus on the question of how groundwater can be maintained within sustainable limits in a drying climate:

- Chapter 4 deals with the risk that unlicensed groundwater uses, which are effectively outside the caps set by allocation limits, can expand to the detriment of other water uses or the environment. We consider the benefits of broader regulatory coverage of these unlicensed uses.
- Chapter 5 addresses the risks associated with setting allocation limits in a drying climate. We consider the benefits of a statutory water planning regime that mandates sustainable extraction limits and consideration of climate change. We also consider how water allocation plans should address environmental objectives in a drying climate, and the impact of other planning processes on groundwater management.
- Chapter 6 deals with the risks associated with a rigid water entitlements system, in which groundwater extraction cannot easily be adjusted to reflect the new reality of reduced rainfall and groundwater recharge. We consider the alternative of a ‘share’ entitlement system, under which a water user has a share in a variable consumptive pool rather than a fixed volumetric entitlement. We also consider the important issue of metering and monitoring to ensure that actual water use does not exceed authorised extraction.

Chapter 7 considers the issue of productive and efficient water use, and the shortcomings of the traditional approach of allocating groundwater resources for free to the first applicant. We consider

\(^{158}\) In doing so we are taking up Sadler’s invitation to see the South West as a laboratory for the study of climate change adaptation in practice: Sadler, above n 1, 8.
the role that market mechanisms, in particular, can play in promoting productive and efficient water use.

Readers familiar with national water policy and its implementation will appreciate that these are not new issues. Western Australia has in fact committed, through the Intergovernmental Agreement on a National Water Initiative, to many of the reforms we discuss, and many of the reforms have already been implemented in other Australian jurisdictions.

While Western Australia is lagging behind in implementing its commitments under the Intergovernmental Agreement, this does have a side benefit: we can consider and learn from the approaches in other jurisdictions. This is something that we seek to do in the following chapters of this report, while always applying the practical test: will the reform help us manage the South West’s groundwater resources more effectively in a drying climate? This is, of course, not the only challenge faced by groundwater managers, but it is a major challenge in the South West of Western Australia and a useful lens through which to view the State Government’s water law reform proposals.
4. Broader regulatory coverage

4.1 Unlicensed water use in a drying climate

Unlicensed groundwater uses may increase relative to licenced use as they are not constrained by an allocation limit. This problem is exacerbated in a drying climate where there is less water available overall. Figure 12 illustrates this problem.

Figure 12: Unlicensed use crowds out licenced use in a drying climate

In principle, a groundwater regulatory framework should at least have the capacity to license all activities that, either individually or cumulatively, have a significant effect on the quantity of groundwater available for consumptive use or the environment.

The RIWI Act currently has a broad capacity to regulate the ‘taking’ of groundwater, but that capacity is not exercised in relation to stock and domestic use – to date, governments have exempted these uses from the licensing requirement because they have assessed the costs of licensing to outweigh the benefits. We consider in section 4.2 whether that position should be reconsidered in the context of the drying South West climate.

The RIWI Act does not currently have the capacity to regulate interceptions of water by plantations, In section 4.3 we consider whether proposed new legislation should have the power to do so.

4.2 Basic landholder rights - domestic garden bores

Use of groundwater to water domestic gardens is a significant unlicensed use of water in the South West. For example, in 2009 there were an estimated 167,000 domestic garden bores in the Perth
metropolitan area, using approximately 73 GL of water a year - about 15 per cent of all groundwater taken in the Perth region. As noted above, while basic water use efficiency standards have been established for watering domestic gardens there is no requirement to hold a licence to take that water. This means that there are no limits on the number of garden bores or the total amount of water they use. As a result, garden bores in metropolitan areas will progressively reduce the amount of water available for other consumptive uses. This is illustrated by the base case scenario adopted in modelling for the Gnangara Sustainability Strategy, under which private licensed groundwater use was assumed to remain at 2007 levels but use by garden bores was assumed to increase by 3 per cent every year.

Current State Government policy does not favour the licensing of domestic garden bores. It does, however, identify large areas of Perth that are unsuitable for such bores (Appendix F). The relevant policy document explains that areas may be unsuitable for a range of reasons, including impacts on local wetlands, the risks of exposing acid sulphate soils and cases in which ‘the area is over-allocated to existing users, and further development of garden bores could present a sustainability risk to the groundwater.’ No regulatory requirements have been put in place to prohibit the construction of new garden bores in areas that have been designated as being unsuitable for that purpose, even though it would be possible to establish such requirements under the Water Agencies (Powers) Act 1984 (WA).

Clearly the administrative costs of licensing water use from a large number of garden bores are a substantial disincentive for regulation. Licensing on this scale is not unprecedented – the WA Fisheries Department, for example, has issued over 200,000 recreational fishing licences – but it is not common. Of other States and Territories, the Australian Capital Territory and South Australia (in the Padthaway and North Adelaide Plains Prescribed Wells Areas) license domestic groundwater use.

Are there other, cheaper regulatory options? One option would be to regulate the construction of new domestic bores in identified areas. Combined with watering restrictions already in place under the Water Agencies (Powers) By-Laws 2010, this would provide a reasonable basis to manage future growth in abstraction in areas that are approaching or at full allocation. In order to keep regulatory costs down, consideration could be given to a ‘co-regulatory’ approach. Rather than requiring individual landholders to obtain a licence, drillers could be licenced subject to a condition prohibiting the construction of wells in specified areas. This new licensing scheme could also have the benefit of ensuring that drillers are appropriately qualified, consistent with national policy.

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161 Department of Water, above n 159, 7.
162 Such a prohibition could be established through by-laws made under s 34(3)(fa) of the Water Agencies (Powers) Act 1984 (WA) which empowers the making of by-laws to ‘prohibit, impose restrictions on or otherwise regulate the use of water’. As noted above by-laws already restrict the use of garden bores in other ways (e.g. by prohibiting watering of domestic gardens in some circumstances).
163 Department of Fisheries, ‘Annual Report 2012-13’ (Government of Western Australia, 2013) 8.
commitments on driller accreditation\textsuperscript{165} and regulatory approaches in other jurisdictions.\textsuperscript{166} This option could be implemented under the current \textit{RIWI Act} or \textit{Water Agencies (Powers) Act 1984 (WA)}.\textsuperscript{167}

Another option would be to licence the taking of water from domestic bores in specified areas. This could be achieved under the current \textit{RIWI Act} by replacing the current, blanket exemption for garden bores with a more limited exemption.\textsuperscript{168} The advantage of this approach from a groundwater management perspective is that existing bores in specified areas would be metered and regulated. The disadvantage would be the greater administrative costs for government and the costs to some bore owners of obtaining a licence and installing metering equipment.

\begin{tabular}{|p{0.9\textwidth}|}
\hline
\textbf{Law Reform Recommendation: Domestic Garden Bores} \\
Consideration should be given to two options: \\
\begin{itemize}
\item to license new and existing domestic garden bores in specified areas; or 
\item to prohibit the construction of new domestic garden bores in specified areas.
\end{itemize}
\hline
\end{tabular}

To minimise regulatory costs, the second option could be implemented by licensing drillers of wells rather than the owners of garden bores. These options could be implemented under existing legislation or the new water resource management legislation.

\subsection*{4.3 Commercial plantations}

Commercial plantations are a good example of unlicensed uses that can have a substantial impact on groundwater resources. In most jurisdictions in Australia, including Western Australia, the manager of a commercial plantation does not need to obtain a water licence for that plantation, even though it may substantially reduce recharge and (depending on the depth to the water table) directly use groundwater. As an unregulated ‘user’ of groundwater, plantations may avoid having to share the burden of increased water scarcity in a drying climate.

\begin{tabular}{|p{0.9\textwidth}|}
\hline
\textbf{Case Study: Pine plantations on the Gnangara Mound, Western Australia}\textsuperscript{169} \\
As noted above, the Gnangara Mound is a superficial aquifer in and around the north of Perth. There are 22 000 hectares of pine plantations overlying the Gnangara Mound. Planting of pines
\hline
\end{tabular}

\textsuperscript{165} Allocation and Use of Groundwater: A National Framework for Improved Groundwater Management in Australia 9 (recommendation 2).
\textsuperscript{166} e.g. Water Regulations 2002 (Qld) Part 2, Division 6; Water Regulations 2009 (Tas) Part 4.
\textsuperscript{167} This could be done under the RIWI Act by removing the current blanket exemption from s26B and replacing it with a more targeted exemption under local by-laws that leaves the license requirement in place for persons constructing domestic bores in specified areas, but not for persons ‘causing, permitting or suffering’ that work to be done: see Rights in Water and Irrigation Act 1914 (WA) ss 26B(3), 26L(3)(c). See footnote 162 above as to by-laws under Water Agencies (Powers) Act 1984 (WA).
\textsuperscript{168} See footnote 52 above on the current exemption.
\textsuperscript{169} Material for this case study is drawn from EPA Bulletin 273; De Silva, above n 160; Gnangara Coordinating Committee, ‘Gnangara Sustainability Strategy: Draft for Public Comment’ (Government of Western Australia, 2009); Western Australian Planning Commission and Water and Rivers Commission, ‘Gnangara Land Use and Water Management Strategy: Final Report’ (2001); Forest Products Act 2000 (WA); Department of Water, ‘Plantation Forestry and Water Management Guideline’ (2009).
commenced in 1918, but it was not until the early 1940s, and particularly since the 1960s, that extensive plantations were established. The plantations are located on State Forest No. 65 and managed by the Forest Products Commission, a statutory body with functions that include the management of plantations and the sale of forest products.

Pine plantations have a significant effect on recharge. Maturing pine plantations effectively stop all recharge and, where the water table is within about 10 m, there is the likelihood that the pines are net extractors of water. Studies by the Department suggest that pine plantations have made a significant contribution to water level decline on two hydrogeological provinces of the Gnangara Mound (table 3).

Table 4: Factors affecting watertable decline on the Gnangara Mound

<table>
<thead>
<tr>
<th>Study and factor affecting decline</th>
<th>Watertable decline (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leederville Window</td>
</tr>
<tr>
<td>Climate</td>
<td>3.0</td>
</tr>
<tr>
<td>Abstraction</td>
<td>1.5</td>
</tr>
<tr>
<td>Pine plantation</td>
<td>1.5</td>
</tr>
<tr>
<td>Da Silva (1979-2008)</td>
<td></td>
</tr>
<tr>
<td>Climate</td>
<td>3.0</td>
</tr>
<tr>
<td>Abstraction</td>
<td>2.0</td>
</tr>
<tr>
<td>Pine plantation</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Pine plantations are not regulated under the RIWI Act. The Department of Water will take into account the effect of pine plantations on recharge in setting water allocation limits and the amount of water available for licenced use. It will also provide advice to other bodies with planning or management responsibilities concerning plantations. However, water use by plantations is not itself licenced.

By 2001 it was agreed that the Gnangara pine plantations would be progressively removed from the Mound. This could be done by the State Government through the Forest Products Commission, as the plantations are in State Forest and are managed by the Commission, which is subject to government-endorsed management plans and Ministerial direction. However, the rate at which removal of pines can be achieved is affected by state agreements to provide a set supply of timber, delivered over a period of up to 25 years, from 2003 from Gnangara and surrounding areas.

Modelling carried out for Gnangara Sustainability Strategy suggests that under a ‘base case’ scenario (gradual removal of pines to 2031) storage will decline by another 500GL before it starts to recover, while under the ‘immediate pine removal’ scenario decline is only another 230GL. This makes clear that the rate at which the pines are removed will have a major impact on efforts to stabilise groundwater decline on the Gnangara Mound. The Draft Gnangara Sustainability Strategy recommends that ‘opportunities for the accelerated removal of pine plantations be investigated within the economics of existing commercial agreements’ (p.x). However, a complicating factor is the importance of the pine plantation as a source of food for the endangered Carnaby’s Cockatoo.
There are a number of lessons that can be drawn from this case study. One basic lesson is that plantations can have significant impacts on groundwater resources. The case study also points to the risk of governments entering into commercial agreements, and parliaments endorsing commercial agreements, that lock in these groundwater impacts over a long period – particularly in the face of a drying climate and increased water scarcity. Finally, the case study illustrates the lack of control water managers have over unlicensed water uses of groundwater.

South Australia’s proposed regulation of plantations on the Lower Limestone Coast provides a useful contrast to the Gnangara Mound case study. South Australia recently amended its water resource management laws to require managers of designated commercial forests to obtain water licences and associated water allocations. This alternative approach has the advantage of bringing water use by plantations within the water planning and licensing system.

**Case study: Commercial plantations on the Lower Limestone Coast Prescribed Wells Area, South Australia**

The Lower Limestone Coast Prescribed Wells Area (LLC PWA) is located in the South East of South Australia. There is significant plantation forestry in the region, representing about 10% of the total land area of the LLC PWA and a greater proportion of mid to southern areas. Softwood plantations (mainly pine) cover approximately 104,000 hectares and hardwood plantations (mainly blue gums) cover approximately 40,500 hectares.

Water level declines in the LLC PWA have been attributed to the combined effect of underground water extraction, reduced rainfall and the effects of land use change – including the rapid expansion of commercial forests in the area in the late 1990s and early 2000s. In recognition of the impact of commercial forests, it is proposed that commercial forestry in the area will be licensed.

The legislative basis for this licensing is provided by amendments to the *Natural Resource Management Act 2004* (SA) that came into effect on 4 October 2013. Under these provisions water allocation plans may identify commercial forests as being appropriate to bring within a licensing regime and principles and methodologies by which to determine the hydrological impact of those forests: s 76(9). The Minister may then, following consultation with the Minister responsible for forests, formally designate the areas in question as ‘declared forestry areas’. Once this has been done forest managers must ensure that the commercial forests they manage are the subject of a forest water licence: s169B.

An important first step in this process has already been taken. The *Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area* (November 2013) identified all commercial forests within the LLC PWA as being appropriate to bring within the licensing regime. The Plan provides that water allocations associated with forest water licences should be quantified based on an assessment of recharge interception and direct groundwater extraction (where applicable). It sets

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170 Material for this case study is drawn from the *Natural Resource Management Act 2004* (SA), the Lower Limestone Coast Prescribed Wells Area Water Allocation Plan, and discussions and email correspondence with Christina Shepherd, Principal Policy Officer, South Australian Department of Environment, Water and Natural Resources.
out in some detail how these amounts should be calculated. For direct groundwater extraction, water use is to be calculated on the assumption of water use of is 1.82 ML/ha/year for hardwoods and 1.66 ML/ha/year for softwoods, where the forest overlies a water table that is less than six metres.

A forestry area has not yet been declared by the Minister under the *Natural Resource Management Act 2004* (SA). The regulations and other administrative arrangements that need to be in place to initiate and administer forest water licensing on an ongoing basis are also yet to be established. The Department and the South East Natural Resource Management Board anticipate that the necessary regulatory and administrative arrangements will be in place in 2014-15.

Once a forestry area is declared, all existing commercial forestry operators will be eligible to apply for a forest water licence that has a water allocation attached that reflects the hydrological impact of the existing forest. Under the forest licensing system, new commercial forest development proposals will be subject to assessment under LLC WAP policy and will be required to purchase water allocations on the water market, as no water remains available for allocation under the Plan.

In areas where over-allocation issues have been identified, the LLC WAP proposes that forest water licensing be used to reduce the impact of commercial forestry by reducing the water allocated to forestry (as well as to other water licence holders) over time. However, it should be noted that, under the *Natural Resource Management Act 2004* (SA), water allocated to forestry may only be reduced after harvesting has occurred, i.e. the water allocations on forest water licences will not be able to be reduced in a manner that would require forest operators to prematurely clear-fell their forests (s169E). Variations of water allocations must be consistent with the relevant water allocation plan, but no compensation is payable for reductions in water allocations.

The South Australian reforms only came into effect in October 2013, so it is difficult to assess their usefulness in practice. Even so, they appear to offer a workable approach to regulating the hydrological impacts of commercial plantations.

**Law Reform Recommendation: Plantations**

Western Australia’s new water resource management legislation should recognise commercial plantations as a consumptive use of groundwater resources and have the capacity to licence water use by commercial plantations.
5. Better groundwater planning

5.1 Statutory water plans and sustainable extraction limits

Good water allocation planning is central to maintaining groundwater use within sustainable limits in a drying climate. It is through this planning that allocation limits are identified. There are two important elements of good water allocation planning in this context. The first is that plans be statutory, in the sense of being made in accordance with requirements in the water resource management legislation. This provides a consistent, legally secure basis to set allocation limits and make administrative decisions consistent with those limits.171 Secondly, the requirements in the water resource management legislation concerning the contents of water allocation plans must provide a sound basis to set and achieve sustainable allocation limits.

As we have seen, Western Australia’s water allocation plans are currently non-statutory, in the sense that they are not made in accordance with the requirements in Part III of the RIWI Act – including the requirement to consult the (non-existent) Water Resources Council. The State Government has indicated that this requirement would be removed in the new water resource management legislation, which should remove any obstacles to the making of statutory water allocation plans in the future.172 However, the State Government clearly intends that there will be a gradual transition to statutory plans. The 2013 Position Paper suggests that this will only occur where

- water resources are approaching or have approached full allocation;
- the water resource is extensive, both in area and in the volume of water available for consumption;
- the science of the resource is sufficiently understood, including historical recharge and usage data;
- there are a relatively large number of users competing for access to the resource; and
- the benefits of establishing a consumptive pool and the supporting systems (including statutory water allocation plans) clearly outweigh the costs.173

What about the contents of the new statutory water allocation plans? In its discussion of the new plans, the State Government states that ‘we need to make sure the amount of water we are drawing on is sustainable’, but does not indicate how the new legislation will address this question.174 We suggest that a minimum statutory requirement should be that plans identify the sustainable yield of each groundwater resource and explain how that figure was calculated. Where the sustainable yield differs from the allocation limit an explanation would have to be provided for that discrepancy.175

171 Gardner, Bartlett and Gray, above n 19, 292-3.
172 Department of Water, above n 64, 18.
173 Ibid 18.
174 Ibid 7.
175 Compare the current approach described in section 1.3 above.
An alternative, stronger approach would be to provide that the allocation limit must be consistent with the sustainable yield. This approach is relatively unusual in water management legislation, but was adopted in the Water Act 2007 (Cth) for the Murray-Darling Basin. That Act requires allocation limits to be consistent with an ‘environmentally sustainable level of take’. This term is defined in the Act. Foerster examined the influence of the ‘environmentally sustainable level of take’ requirement on the development of the Basin Plan. Her conclusion was that while the final diversion limits involved a trade-off between different policy objectives and between the interests of Basin States, they represent a more environmentally sustainable level of trade-off that would have been likely under legislation with weaker parameters.

On balance, we favour the former approach because there may be rare cases in which the Minister should be able to approve an allocation limit that is clearly not sustainable, such as where there is a substantial, pre-existing use that the Minister believes should be able to continue for the life of the project. It would be better to allow for this, and ensure that the unsustainable use is transparently identified with a view to phasing it out in the longer term, rather than to discourage a government from making a statutory water plan for the area.

There are two other points we would make about statutory water plans. The first is that given the significance of these plans, including their influence on the volume of water available to entitlement-holders, there is a good argument that they should be disallowable instruments. This appears to be proposed in Western Australia. The State Government has indicated that that the new water allocation plans will ‘have the force of law and be subject to parliamentary scrutiny’. This suggests that the new Act will require that the plans will, like regulations, be tabled and subject to parliamentary disallowance.

Finally, it is important that statutory plans be supported by effective monitoring and reporting arrangements, in order to ensure that there is transparency as to whether allocation limits are being achieved.

**Law Reform Recommendation: Statutory water allocation plans**

We recommend that the new water resource management legislation:

- provide for the making of statutory water allocation plans that must be tabled in Parliament and may be disallowed
- require those plans to:
  - identify the sustainable yield of each groundwater resource and explain how that figure was calculated
  - explain any discrepancy between the sustainable yield and the allocation limit for a

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176 The Water Act 2007 (Cth), s4 defines “environmentally sustainable level of take” as …the level at which water can be taken from that water resource which, if exceeded, would compromise (a) key environmental assets of the water resource; or (b) key ecosystem functions of the water resource; or (c) the productive base of the water resource; or (d) key environmental outcomes for the water resource.”


178 Department of Water, above n 64, 19.

179 Interpretation Act 1984 (WA) s42.
5.2 A duty to consider and address risks from climate change

The potential impacts of climate change on South West rainfall have been discussed since at least 1987, when the CSIRO produced national climate change scenarios and participated in the conference ‘Greenhouse: Planning for Climate Change’. In a paper to that conference entitled ‘The water resource implications of a drying climate in South West Western Australia’ Sadler, Mauger and Stokes stated that:

Current predictions of the greenhouse-induced changes in this region derive essentially from the expected polewards movements of the atmospheric high pressure belt from the desert latitudes. As a result the winter depression and cold fronts, which bring rain to the South West, will pass further south.

While acknowledging that the magnitude and timing of the expected shift to rainfall was uncertain, Sadler et al put forward a working scenario of a reduction of 20% in average annual rainfall between 1970 and 2040 – a scenario that proved modest in light of actual rainfall since 1987 (Figure 13).

Notwithstanding these early predictions of climate change and its impact on water resources in the South West, climate change projections were first used directly in setting allocation limits in 2009, more than two decades later. There is only one finalised plan that uses climate change projections. The more common approach is to use relatively recent historical records as a basis for estimating future rainfall (see analysis of plans at Appendix D). This is a more conservative approach than using long term average rainfall, but is unlikely to be conservative enough given future climate projections.

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180 Sadler, above n 1, 2.
There is a clear need, acknowledged by the Department of Water, for a more consistent approach to the use of climate change projections in groundwater (and surface water) allocation planning. To that end, the Department has developed a Geographic Information System tool that is capable of producing a time-series of future climate for any part of the State at a gridded resolution of 5km x 5km. The ‘future climate’ includes information on rainfall, but also temperature, radiation, relative humidity, evapotranspiration and evaporation. This tool will be used, in accordance with guidelines currently being developed, in developing water allocation plans. The tool and guidelines are intended to ensure a more consistent approach to baseline periods, scenarios and timeframes for projections, as well more consistent use of climate models.

While there is a need for greater consistency in the use of climate scenarios, the Department has retained an appreciation of the uncertainties associated with climate projections and their impacts on water resources. This is consistent with Bates’s observation that a traditional ‘prediction paradigm’ may be less effective than a planning approach that considers a range of scenarios, informed by the latest climate science, and identifies associated decision points and management responses. This ‘multiple scenarios’ approach has implications for the regulatory system, which needs to have the capacity not only to support effective planning, but also to implement management responses such as reductions in authorised abstraction. As we shall see, there is room for the Western Australian regulatory framework to be improved in these areas.

In the light of the above discussion, we endorse the proposal in the 2013 Position Paper that statutory water allocation plans will ‘describe the effects or potential effects of climate variability or change on the water resources and identify the policy programmes that are included in the plan for managing these effects’. We go further to suggest that, given the importance of climate change

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184 Department of Water, above n 64, 19.
for management of water resources in Western Australia, there should be a requirement in the new Act for the Minister to ensure that water allocation plans consider and deal with climate change impacts. The *Water Act 2007* (Cth), discussed below, provides a possible model.

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**Case Study: Statutory guidance on water planning and climate change**

It is common for water resource management legislation to identify the matters that should be addressed in water plans. While it is by no means common for such legislation to include reference to climate change, examples do exist.

**Murray-Darling Basin, Australia**

The *Water Act 2007* (Cth) states that the Basin Plan must include ‘an identification of the risks to the condition, or continued availability, of the Basin water resources’\(^{185}\) and that:

The risks dealt with must include the risks to the availability of Basin water resources that arise from the following:

(a) the taking and use of water (including through interception activities);

(b) the effects of climate change;

(c) changes to land use;

(d) the limitations on the state of knowledge on the basis of which estimates about matters relating to Basin water resources are made.

(emphasis added)\(^{186}\)

‘Water resource’ is defined broadly to include ‘all aspects of the water resource (including water, organisms and other components and ecosystems that contribute to the physical state and environmental value of the water resource).’\(^{187}\)

The Act also provides that the Basin Plan must include ‘the strategies to be adopted to manage, or address’ these risks.\(^{188}\)

**Victoria, Australia**

The *Climate Change Act 2010* (Vic) prescribes a range of statutory planning functions for which climate change must be taken into account, including decisions made under the *Catchment and

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185 *Water Act 2007* (Cth) s 22.
186 Ibid
188 Ibid
Land Protection Act 1994 (Vic) and Water Act 1989 (Vic).

Ontario, Canada

Ontario’s Clean Water Act and associated regulations take a slightly different approach, providing that assessment reports must include ‘A summary, based on readily accessible information, of how conclusions in the assessment report are likely to be affected by changes to the climate of the source protection area in the 25 years following preparation of the report.’

Law Reform Recommendation: Duty to address climate change in making statutory water allocation plans

We recommend that the new water resource management legislation require statutory water allocation plans to address the risks to water resources from climate change, and the strategies to be adopted to manage or address those risks.

5.3 Sharing groundwater with the environment in a drying climate

This chapter has focussed, to date, on what water resource management legislation should say about the nature and content of water allocation plans. In this section we will go a step further to consider what these plans themselves should say about environmental water allocations in a drying climate.

As a number of commentators have noted, climate change is relevant to the environmental objectives set by water allocation plans. The National Water Commission has made the point that:

Future adaptation responses may involve making difficult ‘triage’ decisions in managing water-dependent ecosystems. They may include decisions about whether to continue to water already degraded sites that are unlikely to survive due to climate change.

The reverse proposition is also true: that difficult triage decisions may need to be made to reduce or remove consumptive use in order to sustain important environmental assets under pressure from climate change, such as Ramsar-listed wetlands or areas containing threatened species or ecological communities.

Underlying these decisions is a fundamental question: how should a declining water resource be shared between environmental and consumptive use in a drying climate? Western Australia’s experience with managing groundwater-dependent ecosystems on the Gnangara Mound provides a case study that may help us answer these questions.

189 Clean Water Act SO 2006 s 15(2)(i); Ontario Regulations 298/07 r 13(1) (item 7).
The Gnangara Mound is a superficial aquifer in and to the north of Perth. Recharge is by annual rainfall. Discharge is primarily from evapotranspiration, but also partly from outflow to oceans and rivers and leakage to underlying aquifers. The amount of groundwater which can be extracted from the Mound is mainly determined by the desire to limit impact on the environment, particularly the wetlands of the area.

In 1987 the Environmental Protection Authority (EPA) assessed a proposal by the Water Authority (which was at that time both the public water utility and the water regulator) to abstract groundwater from the Gnangara Mound for public water supply. By this time streamflow to dams had already declined substantially (see Figure 6 above) and new water sources were needed for Perth’s expanding population.

A central issue considered by the EPA was how the social and ecological values of wetlands could be protected. To this end, the EPA recommended ‘preferred minimum water levels’ and ‘minimum water levels’ for specified wetlands. These levels were based on an assumption that a 0.5m change in water level should be the limit for the most environmentally sensitive areas. The EPA acknowledged that, given the complexity of wetlands and the factors affecting them, setting limits in this way was ‘somewhat arbitrary and non-scientific’, but suggested that it be used as an interim approach.

The EPA noted in its 1987 report that ‘there is mounting, but not universally accepted evidence, that the burning of fossil fuels and the release of carbon dioxide into the atmosphere will produce a warming of the Earth’s climate in the decades ahead’ and that the effects predicted for the South West included lower rainfall and associated impacts on wetlands. It did not, however, suggest that this be taken into account in determining water level criteria, suggesting instead that it may be appropriate to measure water levels against ‘recent historic low water levels’.

In response to the EPA’s advice, the Minister approved the proposal subject to conditions that incorporated water level criteria for wetlands. Other monitoring sites for groundwater-dependent vegetation were subsequently added to the Ministerial conditions, each with minimum water level requirements.

There were increasing levels of non-compliance with water level requirements from the mid-1990s (Fig 14). Non-compliance with Ministerial Conditions is a serious offence (under the current Act a ‘Tier 1’ offence) but enforcement action was not taken. This may in part have been because the proponent was a government agency, but that fact that reduced rainfall was a major cause of

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191 Material for this case study is drawn from Ministerial Statements 21, 437, 438, 687, 819; EPA Bulletins 273, 1115, 1324; triennial compliance reports submitted to the Environmental Protection Authority; Gnangara Coordinating Committee, above n 169; and Department of Water, ‘Environmental Management of Groundwater Abstraction from the Gnangara Mound: Triennial compliance report to the Office of the Environmental Protection Authority: Jul 2009 - June 2012’ (2013).
reduced water levels is likely to have also been a contributing factor.

Figure 14: Non-compliant sites on the Gnangara Mound (% of total sites)

In 2009, the EPA accepted that seven sites should be removed from the Ministerial Conditions because they had lost their original environmental values or were predominantly affected by climate and land use rather than abstraction. This advice was accepted by the Minister, and was formalised in a new set of Ministerial conditions published in December 2009.

The draft Gnangara Sustainability Strategy (‘draft strategy’) was also released for public comment in 2009. The draft strategy was an interagency initiative that considered future land use and abstraction options in the light of climate change scenarios. The draft strategy and associated reports included projections of future water levels on the Gnangara superficial aquifer under different climate, land use and abstraction scenarios.

One of the key questions addressed in the GSS was how environmental objectives should be set in a drying climate. It characterised this task as follows:

Any management approach to the environment supported by the system needs to start with the fundamental question of what environment are we likely to have in 2030? That is, what groundwater-dependent ecosystems will be maintained in the context of a drying climate and the continued decline of groundwater levels in the Gnangara system? This question reflects the dominance of a drying climate on any land use and water management actions that may be taken.

The draft strategy found that ‘[s]etting Ministerial conditions based on groundwater levels recorded in a wetter period of time has resulted in breaches that could not be averted by any water and land management practice’ (p28) and that ‘conditions based on setting fixed water level criteria are no longer appropriate under current climate conditions’ (vii).
The draft strategy identified 45 wetlands as significant in terms of biodiversity values and ecological function, and recommended the following management measures for those areas:

- An ‘adaptive management approach to the monitoring of the environmental impacts of water decline’ be developed, including a separation of the role of climate, public abstraction and private abstraction; long-term monitoring of indicator species to detect ecosystem change; and frequent review of management actions.
- Development of ‘local area models and risk assessments to identify wetlands and other groundwater-dependent ecosystems most at risk from declining water levels’.
- ‘Where wetlands are predicted to dry out despite land and water management interventions, management should centre on transition to a terrestrial ecosystem’.
- ‘Opportunities to augment groundwater levels using recycled water, either directly or in the vicinity of high value ecosystems, be investigated.’
- ‘Blocks of remnant bushland be protected from clearing, further fragmentation and multiple threats (fire, dieback, feral animals, weed invasion and groundwater level decline) to strengthen the ecological resilience of the system and that these blocks and existing conservation reserves be complemented by a series of regional ecological linkages.’

The draft strategy also recommended reductions in abstraction for public water supply, private licensed abstraction and unlicensed abstraction.

There do not appear to be any plans to finalise the draft strategy. However, it remains an important document and source of recommendations for the future management of the Gnangara Mound.

This case study emphasises the importance of taking climate change scenarios into account in framing environmental objectives – particularly where those objectives become part of legally requirements that may last for several decades. Perhaps understandably, given the state of climate science in 1987, a drying scenario was not considered by the EPA in its advice on minimum water level requirements. The result was ‘regulatory lines in the sand’ which implicitly assumed a stable climate and which proved hard to change when a drying trend was detected.\(^{192}\)

While environmental objectives expressed as fixed ‘regulatory lines in the sand’ may not always work in a drying climate, they do have their benefit of clarity and measurability – you know when they have been breached. One study undertaken by the National Water Commission suggests that despite their flaws water level criteria on the Gnangara Mound did have a number of benefits:

The original trigger levels, although relatively simple, undoubtedly resulted in greater conservation of GDEs [groundwater-dependent ecosystems] than would have occurred in their absence. The breaches of criteria levels became an important driver for improving the understanding of GDE dependence, and scientific investigations have been used to inform revisions to the Ministerial conditions.\(^ {193}\)

\(^{192}\) McFarlane et al, above n 143, 328.

\(^{193}\) Sinclair Knight Mertz, above n 110, 7.
This gives rise to a dilemma. Fixed environmental objectives, such as water level criteria for wetlands, may not be appropriate in a drying climate but more amorphous 'adaptive management' approaches may not give the environment the protection it needs. American academic Robin Kundis Craig considers this issue in her analysis of principles for climate change adaptation law. She concludes that there does need to be flexibility in environmental management goals where there are changing baseline conditions due to climate change, but this should be 'principled flexibility'. She defines 'principled flexibility' as meaning that:

both the law and regulators (1) distinguish in legally significant ways uncontrollable climate change impacts from controllable anthropogenic impacts on species, resources, and ecosystems that can and should be actively managed and regulated, and (2) implement consistent principles for an overall climate change adaptation strategy, even though the application of those principles in particular locations in response to specific climate change impacts will necessarily encompass a broad and creative range of adaptation decisions and actions.

Craig goes on to argue that one of the principles for an overall climate change adaptation strategy should be improvement of resilience and adaptive capacity, rather than traditional legal objectives of preservation and restoration.

We would add to this analysis that in a water allocation planning context, 'principled flexibility' could continue to involve the use of regulatory requirements such as minimum water level requirements, as long as these requirements are regularly reviewed through the plan review process. This would have the benefit of ensuring that if any ‘triage’ decisions are made to abandon environmental assets this is at least done in a considered way, with the benefit of community consultation.

Keeping these points in mind, we return now to the first question we posed earlier: how should a declining water resource be shared between environmental and consumptive use in a drying climate? We suggest that this question cannot be answered by a mathematical formula, such as a rule that reductions should be shared equally between environmental and consumptive uses. Rather, it should be determined by a planning process, undertaken with the benefit of community consultation, that:

- identifies environmental objectives in the context of climate change scenarios;
- sets out management measures that will be adopted to achieve those objectives; and
- involves regular reviews and adjustments in light of new information.

In a number of respects the draft Gnangara Sustainability Strategy provides a model of good groundwater planning in a climate change context. While there is no doubt room for debate on the detail, the strategy at least explores the consequences of future climate change and how it should be addressed. It deals with the difficult question of how to manage water sustainably in a drying climate by proposing management measures, including land use management measures to

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196 Ibid 18, 39.
strengthen ecological resilience and reductions in public and private water allocations. It is a useful model for water planners in areas likely to be affected by a drying climate to consider.

5.4 Links between groundwater allocation planning and other planning processes

Water supply and demand management planning

The effectiveness of groundwater management in responding to changing climatic conditions will inevitably be dependent, at least in part, on planning processes outside the formal groundwater allocation planning framework. One important area is public water supply and demand management planning. Clearly, groundwater allocation planning and water supply planning affect each other. The constraints imposed by groundwater allocation limits can accelerate planning for other water sources (e.g. desalination); conversely, if alternative water sources are not planned for and available when rainfall declines then there is likely to be strong community and political pressure for generous groundwater allocations to avoid severe water restrictions.

A detailed examination of public water supply planning is beyond the scope of this Report, but we will note some issues that would benefit from more detailed legal analysis. First, there are institutional questions: who should be responsible for carrying out water supply and demand management planning? It could be argued that the approach in the South West over recent decades – of giving a monopoly provider the task of delivering, and to a large extent planning, public water supply promotes good contingency planning and a rapid response to a drying climate.197 On the other hand, the Economic Regulation Authority has argued that a lower cost solution would be an ‘Independent Procurement Entity’ responsible for procuring water sources and demand management options in line with water security requirements specified by government.198

Secondly, there is the question of whether public water supply and demand management planning should be given a legislative basis. As we have seen, there is a legislative basis for water allocation plans, which the government intends to refresh through new legislation to replace the RIWI Act. The new legislation will no doubt include guiding principles, consultation requirements and the like. Should water supply and demand management planning have a similar legislative basis – including a duty to consider the impacts of climate change? California is one jurisdiction that has adopted this approach (see case study below). In Western Australia, one option would be the use of a legislative instrument – a Code of Practice under the Water Services Act 2012 (WA) – to address these matters.199 Given the significance of climate change for water supply and demand

197 M. G. Porter, ‘A Tale of Two Cities: Desalination and Drought in Perth and Melbourne’ (Alfred Deakin Research Institute, Deakin University, 2013) 21, citing former Water Corporation CEO Dr Jim Gill (‘...when the going gets tough, accountability is a million per cent clear - ‘one bum to kick’ - only one corporation to plan for the very worst contingency.’)
199 Under ss 26 and 12(q)-(r) of the Water Services Act 2012 (WA) the responsible Minister may make a code of practice dealing with, among other things, ‘planning for the development of future water sources’ and ‘developing and implementing programmes for the conservation and efficient use of water’. Licensees (such as the Water Corporation)
management planning, particularly in the South West of Western Australia, we would recommend that the risks of climate change, and associated responses, should be a mandatory consideration in water supply and demand management planning.

**Case Study: Legal requirements for urban water planning in California**

Under California’s *Urban Water Management Planning (UWMP) Act* urban water suppliers must prepare an Urban Water Management Plan every 5 years. These plans must assess the reliability of water sources over a 20-year planning horizon.

Plans must, among other things:
- describe the reliability of the water supply and vulnerability to seasonal or climatic shortage to the extent practicable
- provide data for an average water year, a single dry water year and multiple dry water years
- for any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

Before adopting a plan, the urban water supplier must make the plan available for inspection and hold a public hearing on the plan. The Department of Water Resources reviews plans to make sure they have complied with the requirements in the UWMP Act.

There are water supply and demand management models in Australia that are supported by a legislative base. For example, under the *Water Act 1989* (Vic), there is provision for the making of sustainable water strategies which are to provide for the strategic planning of a region’s water supply. The legislated requirements are that the strategies identify threats to the supply and quality of environmental and consumptive uses in the region, and set priorities for managing demand for water and investing in infrastructure for the supply of recycled water. There is a public consultation process in the making of the strategies, including the appointment of a panel if desired, and once this is complete the Minister can endorse, amend or reject a strategy. Four sustainable water strategies have been made under these provisions.
Finally, there is the issue of what regulatory tools should be available to promote demand management. Examples in Australia include requirements on large users of scheme water to prepare and comply with water efficiency plans, restrictions on scheme water use (e.g. for watering gardens) and minimum standards and ‘star ratings’ to promote more water-efficient products. A useful area of future research would be an international comparative study of regulatory tools of this kind which identify the range of tools, analyse different design features and quantify the water savings they have achieved in practice.

**Land use planning**

As with water supply planning, land use planning can also have a major influence on whether groundwater use is maintained within sustainable limits in a drying climate. We have not yet had an opportunity to closely consider the relationship between groundwater allocation planning and land use planning in the South West, but would welcome any comments or suggested case studies, particularly if they have implications for the design of water resource management legislation. One possible case study concerns efforts to integrate water allocation planning and planning for urban development in Perth’s North West corridor. Another concerns rural land in Wanneroo, regarding the compatibility of designated land use zoning with water availability.

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206 Water Agencies (Water Use) By-Laws 2010 (WA), Part III.
207 Water Services Regulations 2013 (WA), Part V.
208 Water Efficiency and Labelling Standards Act 2005 (Cth) and associated state and territory legislation.
210 There have been a number of State Administrative Tribunal cases seeking review of decisions to refuse subdivision of rural land on the ground that groundwater was not available to support horticultural activities: Strawbridge & Anor and Western Australian Planning Commission [2006] WASAT 96 (allowed); Maher & Anor and Western Australian Planning Commission [2006] WASAT 129 (refused); Bojanich and Western Australian Planning Commission [2006] WASAT 315 (refused); Waddell v Western Australian Planning Commission [2007] WASAT 82 (refused).
6. Flexible water entitlements

6.1 The need for flexibility in a drying climate

There is a greater risk, in a drying climate, that groundwater resources will become over-allocated. This over-allocation is recognised when allocation limits are lowered to reflect the realities of reduced groundwater recharge (Figure 15). As we have seen, this has occurred in the South West where a number of groundwater resources have become over-allocated.211

Figure 15: Recognising over-allocation: adjustment to allocation limits in a drying climate

This raises the question of what legal mechanisms are available to address over-allocation. We consider below the mechanisms that are currently available under the RIWI Act and how they have been used in South West groundwater areas, before turning to consider an alternative entitlements system.

6.2 Problems with the existing entitlements system

Variation of volumetric entitlements: current regulatory options

As discussed in Chapter 1, the practice in Western Australia is for groundwater licences to specify a maximum volume of water that may be taken under that licence each year. There are a number of regulatory options available to reduce this amount in order to address over-allocation. The allocation specified in the licence may be varied by licence amendment, or licences may be

211 See n 150 above.
renewed with a reduced amount specified on the licence. Directions may also be issued by the Minister (or delegate) to reduce the amount of water that may be taken. Key features of these regulatory mechanisms are summarised in Table 5.

**Table 5: Existing regulatory mechanisms to address over-allocation**

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>When it may be used</th>
<th>Compensation issues</th>
<th>Procedural issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministerial direction (temporary reductions)</td>
<td>Where the quantity of water in a water resource is, or is likely to be, insufficient to meet demand, including any demand made by the needs of the environment; or where a water shortage declaration has been published in the Government Gazette.</td>
<td>No compensation.</td>
<td>Direction must be served in writing on the persons in question. Persons subject to direction may apply to State Administrative Tribunal to review the direction.</td>
</tr>
<tr>
<td>Licence amendment: general</td>
<td>To protect the water resource or associated environment from unacceptable damage, or to prevent a serious inconsistency arising with an approved plan.</td>
<td>Compensation may be available, but broad exceptions apply.</td>
<td>Minister (or delegate) must consult licensee before amending licence. Licensee may apply for compensation. Licensee may apply to State Administrative Tribunal to review a decision to amend the licence or refuse compensation.</td>
</tr>
<tr>
<td>Licence amendment: 'use it or lose it'</td>
<td>Where the quantity of water that may be taken under the licence has consistently not been taken.</td>
<td>No compensation.</td>
<td>Minister (or delegate) must consult licensee before amending licence. Applicant may apply to State Administrative Tribunal</td>
</tr>
</tbody>
</table>

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212 *Rights in Water and Irrigation Act 1914 (WA)* s 26GD.
213 *Rights in Water and Irrigation Act 1914 (WA)* s 26GH(1).
214 Ibid sch 1, cl 34.
215 Above pp 11-12
216 *Rights in Water and Irrigation Act 1914 (WA)*, sch 1, item 26.
217 *Rights in Water and Irrigation Act 1914 (WA)*, sch 1, item 39.
218 *Rights in Water and Irrigation Act 1914 (WA)*, ss 26GG(1)(e), 26GH(2).
219 *Rights in Water and Irrigation Act 1914 (WA)*, sch 1, cl 24(2)(d).
220 Above p 11-12.
221 *Rights in Water and Irrigation Act 1914 (WA)*, sch 1, cl 26.
Use of regulatory options in practice

Use of licence amendments and directions to address over-allocation

As we have seen, there is a significant problem with groundwater over-allocation in the South West. Western Australia has committed, as part of the NWI, to identify and achieve ‘firm pathways’ to address over-allocation of this kind. However, as the following case studies illustrate, there has only been limited use of licence amendment powers to address over-allocation. Public water supply licences have been amended in some cases, but with considerable flexibility to allow increased allocations in dry years. For private users, licences have only been amended to claw back unused entitlements under the ‘use it or lose it’ policy. The directions power has also not been used to address over-allocation. A notice was published in 2002 declaring a water shortage for the South West, but has not been used as a basis to issue Ministerial directions to address over-allocation.

Case study: Over-allocation in the Collie groundwater area

The proclaimed Collie groundwater area covers what is known as the ‘Collie Coal Basin’. There is substantial over-allocation in parts of the Basin due to dewatering associated with open cut coal mining and use of groundwater for cooling purposes in three coal-fired power stations. This over-allocation has had significant impacts, with groundwater levels declining by up to 50m compared to its pre-mining state in some areas.

The Premier–Lower Collie resource is the most heavily over-allocated, mainly due to mine dewatering. The Upper Collie Water Allocation Plan (2009) indicated that the allocation limit for this resource is 2.2GL/yr and the volume of mine dewatering entitlements is 49GL/yr. The Plan did not propose any measures to reduce this allocation, although it did provide that licensing for ‘consumptive purposes’ (by which it presumably means non-dewatering purposes) will not be

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222 Rights in Water and Irrigation Act 1914 (WA), sch 1, cl 39.
223 Rights in Water and Irrigation Act 1914 (WA), s 26GG(1)(c).
224 Council of Australian Governments, above n 9, cl 25(v).
225 As we see below, the Upper Collie Water Allocation Plan does flag a broader approach of reducing allocations on licence renewal, but this has not yet occurred in practice.
227 Pers comm Mick Owens, Department of Water, 21 November 2013.
228 Department of Water, 'Upper Collie Water Allocation Plan' (Government of Western Australia, 2009) 9.
allowed above 2.2GL/yr so that ‘groundwater levels ... will begin to recover once dewatering ceases’.  

While mining and associated dewatering now longer affects the Cardiff-Lower Collie and Cardiff-Muja resources, these resources are also substantially over-allocated, due mainly to use of the water in power station cooling. The Plan committed to a more proactive strategy to address over-allocation for these groundwater resources, stating that ‘no more water is available for allocation’ and ‘[a]s current licences expire, the department will reduce allocations upon licence renewal.’

As table 6 indicates, over-allocation has increased in the two of the three groundwater resources described above, and has remained the same in the third.

Table 6 : Over-allocation in Collie Groundwater Area (2009-2014)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier - Muja</td>
<td>200%</td>
<td>2427%</td>
<td>2382%</td>
<td>3136%</td>
<td>3136%</td>
<td>3136%</td>
</tr>
<tr>
<td>Cardiff - Lower Collie</td>
<td>256%</td>
<td>256%</td>
<td>256%</td>
<td>296%</td>
<td>296%</td>
<td>296%</td>
</tr>
<tr>
<td>Cardiff - Muja</td>
<td>146%</td>
<td>146%</td>
<td>146%</td>
<td>146%</td>
<td>146%</td>
<td>146%</td>
</tr>
</tbody>
</table>

Case Study: Over-allocation in the Gnangara Groundwater System

The Gnangara Groundwater Allocation Plan (2009) recognised that some management sub-areas had become over-allocated, and identified a number of management responses aimed at reducing the level of licenced abstraction in over-allocated areas – although without identifying a pathway or timeline for achieving this result.

The plan committed to refusing applications for new water entitlements in over-allocated areas; reducing Water Corporation’s allocation for the Integrated Water Supply System; and recouping unused water entitlements. These management responses were implemented. In the case of the second measure, however, the Water Corporation was given considerable flexibility to obtain increased allocations in low-streamflow years, formalised through licence amendments.

Prior to 2012-13, decisions on whether the Water Corporation should be granted these licence amendments was influenced by the ‘Variable Groundwater Abstraction Rule’, under which the quantity of groundwater extraction for the Integrated Water Supply System was inversely proportional to the inflow to dams (Figure 16).

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229 Ibid 23.
230 Ibid.
231 Ibid.
From 2012-13 the Variable Groundwater Abstraction rule was replaced with a policy requirement for a five year average abstraction of 110 GL (from existing bores). This stricter requirement coincides with the first stage of the Binningup desalination plant becoming fully operational. The Department of Water has explained the problem with the Variable Groundwater Abstraction Rule prompting this change of approach as follows:

The [Variable Groundwater Extraction Rule], which uses groundwater to ‘buffer’ dry years, is only effective to manage variation around a steady average rainfall. In a declining rainfall trend it results in sustained high groundwater abstraction, compounding the effects of low recharge on the groundwater system.

Licenced entitlements in over-allocated groundwater areas increased between 2009 and 2012, before declining in 2013 and 2014 (Table 7). The main reasons for the reduction from 2012 appears to be reduced abstraction for the Integrated Water Supply System as rainfall recovered from the very dry winter of 2010 and desalination output increased (Table 8). Due to these factors the Water Corporation did not need to apply to amend their licences to the same extent as in previous years.

Licenced entitlements in over-allocated areas with a high proportion of private entitlements, such as the horticultural area of Wanneroo, did not experience any sustained reduction in entitlements, suggesting that the practice of recouping unused entitlements only made modest contributions to addressing over-allocation (Table 9).

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232 Department of Water, above n 32 (Gnangara Groundwater Areas Allocation Plan), 56
233 Department of Water, above n 144, 12. This statement suggests that abstraction over 110GL would be ‘paid back’ by lower abstraction within a 5-year period. We understand the question of whether the 110GL limit should operate in this manner is an ongoing point of discussion between the Water Corporation and the Department of Water.
Table 7: Gnangara groundwater system: licenced entitlements in over-allocated areas

<table>
<thead>
<tr>
<th>Year</th>
<th>2008/09</th>
<th>2009/10</th>
<th>2010/11</th>
<th>2011/12</th>
<th>2012/13</th>
<th>2013/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total licensed entitlements (GL)</td>
<td>189.3</td>
<td>190.7</td>
<td>206.2</td>
<td>206.7</td>
<td>191.7</td>
<td>171.8</td>
</tr>
<tr>
<td>Aggregate of allocation limits (GL)</td>
<td>170.4</td>
<td>170.4</td>
<td>170.4</td>
<td>170.4</td>
<td>170.4</td>
<td>170.4</td>
</tr>
</tbody>
</table>

Table 8: Contributions of major water sources to the Perth metropolitan area water supply

<table>
<thead>
<tr>
<th>Year</th>
<th>2008/09</th>
<th>2009/10</th>
<th>2010/11</th>
<th>2011/12</th>
<th>2012/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater (GL)</td>
<td>146</td>
<td>120</td>
<td>164</td>
<td>158</td>
<td>140</td>
</tr>
<tr>
<td>Streamflow (GL)</td>
<td>121</td>
<td>136</td>
<td>115</td>
<td>81</td>
<td>47</td>
</tr>
<tr>
<td>Desalination (GL)</td>
<td>43</td>
<td>48</td>
<td>52</td>
<td>79</td>
<td>96</td>
</tr>
<tr>
<td>TOTAL (GL)</td>
<td>245.5</td>
<td>244.2</td>
<td>241.7</td>
<td>240.5</td>
<td>241.5</td>
</tr>
</tbody>
</table>

Notes:  
1: Total water supplied to Perth Metro area. Total volume excludes water transferred to South West and Goldfields Agricultural regions and system losses including environmental releases from some surface water dams to maintain downstream environment.

Table 9: Licenced entitlements in over-allocated areas, Wanneroo

<table>
<thead>
<tr>
<th>Year</th>
<th>2008/09</th>
<th>2009/10</th>
<th>2010/11</th>
<th>2011/12</th>
<th>2012/13</th>
<th>2013/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater (GL)</td>
<td>27.4</td>
<td>26.6</td>
<td>25.9</td>
<td>25.4</td>
<td>25.5</td>
<td>25.4</td>
</tr>
</tbody>
</table>

There are a number of different explanations for the reluctance to use licence amendment powers to address over-allocation. In the case of mine dewatering in Collie, for example, there has clearly been a deliberate policy decision to allow continued over-allocation in order to facilitate ongoing coal mining. However, we would suggest that in some cases (including in the case of private licensees on the Gnangara Mound) there are three features of the regulatory framework that discourage the use of powers to reduce licensed water allocations.

First, licensees have an expectation of a fixed annual volumetric water entitlement. It is true that prior to 2012 it was common practice for licences to include a condition that ‘should the licensee’s draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn’. However this is a limited expression of the circumstance in

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235 Aggregated by the authors from figures provided by the Department of Water. The data is drawn from 37 sub-areas/aquifers in which licenced entitlements exceeded the allocation limit at any time over the period in question.

236 Aggregated by the authors from figures provided by the Department of Water.

237 The quoted condition appears on licences obtained in 2010 by Alex Gardner in response to a Freedom of Information request for water licences in the Carabooda, Lake Gnangara, Mariginiup, Neerabup, Nowergup and Eglington groundwater sub-areas. The Department of Water advised the authors that it was common practice to impose this condition prior to 2012, but that following a review of licence conditions the Department determined that it was more appropriate to rely on the licence amendment process to vary the volume of water the licensee could take under a licence per comm Caroline Mellish, Department of Water, 22 November 2013.
which licences may be amended (it does not cover environmental impacts for example) and it is no longer the Department’s practice to impose this condition.

Secondly, it is administratively onerous to address over-allocation through licence amendments and directions. Not only must this be done on an individual amendment/direction basis, but there are rights of comment and review available to each licensee. Given that a single review application in the State Administrative Tribunal could cost the Department of Water tens of thousands of dollars in legal fees and staff time, the Department would be reluctant, to say the least, to issue hundreds of directions or licence amendments to address a widespread allocation problem.

Finally, at least in relation to general licence amendments, there is the possibility of compensation claims being made. As discussed above there are very broad exemptions to the rule that compensation is payable for reducing water allocations, but there is still scope for expensive Tribunal cases reviewing decisions not to pay compensation.

6.3 An alternative approach: share-based entitlements

We now turn to consider one of the fundamental reforms in the Intergovernmental Agreement on a National Water Initiative (‘NWI’): the creation of a new water entitlements regime. In place of the traditional model of fixed term licences to access a specified volume of water each year, the NWI provides for rights to a ‘perpetual or open-ended share of the consumptive pool of a specified resource, as determined by the relevant water plan’.\(^{238}\) The NWI provides that these rights will, among other things, be exclusive, tradeable, enforceable and recorded in publicly-accessible water registers. Carruthers and Mascher have described these provisions as follows:

> Taken together, these requirements ... focus on providing the holder of access entitlements with clearly defined rights that possess the traditional characteristics of a property right: exclusivity, alienability, and enforceability. However, by describing access entitlements as a “perpetual or open-ended share of the consumptive pool of a specified water resource, as determined by the relevant water plan”, the NWI strives to deliver security and certainty while at the same time avoiding the problems associated with over-allocation.

The value of this entitlement regime in a drying climate is obvious. It has the potential to avoid the risk of over-allocation that is associated with granting fixed entitlements to a variable, and probably declining, resource. There are two particular advantages of the regime compared to Western Australia’s current entitlement system: first, it makes clear to entitlement-holders from the outset that their groundwater allocation may be varied to keep overall allocations within sustainable limits; and second, it is administratively easier to make such variations, because this can be done by adjusting the consumptive pool rather than individually amending licences (Figure 17).

\(^{238}\) Council of Australian Governments, above n 9, para 28.
Other Australian jurisdictions have used a range of approaches to implementing this entitlements regime. As illustrated by the examples in Table 9, there are a number of different ways in which a water access entitlement can be expressed and the amount of water that may be taken under that entitlement determined. However, common features of all regimes are:

- it is clear from the outset that the entitlement is to a share of a variable consumptive pool;\(^{239}\) and
- a periodic announcement can determine how much water can be taken against these entitlements from the consumptive pool.

Table 10: Examples of NWI-consistent water access entitlements

<table>
<thead>
<tr>
<th>Jurisdiction (groundwater area)</th>
<th>Example of entitlement</th>
<th>Example of allocation against entitlement</th>
<th>Amount credited to water account</th>
<th>Allocation instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT (Cotter)(^{240})</td>
<td>5% of available water</td>
<td>Available water is 2050 ML/pa</td>
<td>102.5 ML</td>
<td>Ministerial determination (disallowable instrument; last groundwater determination 2007)</td>
</tr>
<tr>
<td>NSW (Peel Valley)(^{241})</td>
<td>100 units/pa</td>
<td>1 unit equals 0.73 ML</td>
<td>73 ML</td>
<td>Ministerial determination</td>
</tr>
</tbody>
</table>

\(^{239}\) In the case of Victoria entitlements do have a nominal volumetric allocation, but the nature of the entitlement is made clear by their name – they are called ‘water shares’: Water Act 1989 (Vic), Part 3A.


\(^{241}\) Example drawn from Minister for Primary Industries, ‘Available Water Determination Order for the Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2013’ (26 June 2013).
Under the NWI, the allocation of water to a water access entitlement must be consistent with the relevant water plan. Table 11 provides some examples, drawn from groundwater allocation plans elsewhere in Australia, of how these allocation rules can be framed in water allocation plans. For ease of understanding we have assumed in these examples that the entitlement is to a percentage share of an amount identified in an allocation determination, but the rules could also be adapted to work with entitlements expressed as unit shares or nominal volumes.

Table 11: Examples of rules for water allocations against water access entitlements

<table>
<thead>
<tr>
<th>Approach</th>
<th>Example of Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified consumptive pool</td>
<td>The allocation is 100 ML/pa.</td>
</tr>
<tr>
<td>Groundwater level trigger</td>
<td>If the average groundwater level is between 530m and 535m above sea level at 15 September then the allocation is 140ML/pa.(^{244})</td>
</tr>
<tr>
<td>Recharge trigger</td>
<td>The annual allocation is 35% of the average annual recharge over the preceding 10 years.(^{245})</td>
</tr>
</tbody>
</table>

The NWI entitlements regime has the potential to effectively manage groundwater use in a drying climate. Whether it is successful in doing so will depend, in part, on the design of water allocation rules. The following case study provides an example of how these rules could be designed to anticipate climate change impacts and the needs of water users.

**Case Study: Climate change, groundwater and water allocation on the Eyre Peninsula**

A discussion paper on climate change and groundwater in South Australia’s Eyre Peninsula\(^{246}\) has highlighted the risks of climate change for that area, and discussed the way in which allocation rules could be framed to address those risks.

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\(^{243}\) Council of Australian Governments, above n 9, 29.

\(^{244}\) This example is drawn from Government of Victoria, ‘Loddon Highlands Water Supply Protection Area Groundwater Management Plan’ (2012) 16 (but in that case the rule was that the allocation must be 75% of nominal volumetric entitlements).

\(^{245}\) This approach was used in Eyre Region Water Resources Planning Committee, ‘Water Allocation Plan for the Musgrave Prescribed Wells Area’ (2001) 10 (although not in conjunction with periodic allocation determinations) and was discussed but not recommended in Goulburn-Murray Water, ‘Review of the Katunga Water Supply Protection Area Groundwater Management Plan’ (2012) 24-25.

\(^{246}\) Eyre Peninsula Natural Resources Management Board, ‘Discussion Paper: Climate Change and Groundwater’ (Government of South Australia, 2010).
The paper states that, while there are many sources of uncertainty in the work produced to date, modelling suggests a potential for groundwater recharge to decrease in the order of 30-50% by 2030 and 50-80% by 2070 under a high emissions scenario.

The paper notes that current groundwater management plans for this area, which are reviewed every five years, already use a ten year rolling average of recharge as the basis for setting water allocations that vary in response to the climate.

For future water allocation plans, the paper suggests that ‘there may need to be some trade-offs between adaptive management where allocations vary according to current (recent) resource condition trends and fixed allocations that provide better water security.’

One option suggested by the paper is to provide high security water entitlements that are fixed for five years, and other water entitlements that may have more variable allocations. This option can be seen as creating two consumptive pools; a high security pool from which are made high reliability annual allocations to the fixed entitlement holders, and a general security pool from which are made variable allocations to the general entitlement holders taking into account current recharge. As resource security is a ‘zero-sum commodity’ this will tend to give less security to ordinary water users.247

The 2013 Position Paper indicates that the new water resource management legislation will provide the basis to establish perpetual, share-based entitlements of the kind we have been discussing. This would not occur on enactment of the new legislation however: it would only apply in areas with statutory water allocation plans that provides for the introduction of such entitlements.248 As these plans are to be developed over time, it will be important to have interim arrangements and tools to achieve the required flexibility.

For areas not covered by statutory water allocation plans, the 2013 Position Paper proposes something of a hybrid between the current licensing system and the NWI entitlement regime: existing fixed term licences would continue, but the volume of water that may be taken under those licences would be able to be varied more easily. One example provided by the Position Paper is the use of ‘periodic allocation announcements’ that would involve ‘a percentage change to volume available under the allocation issued periodically.’249

These are important reforms that should overcome the problems associated with the current entitlements system that we identified in section 6.2.

247 John Quiggin, ‘Uncertainty, Risk and Water Management in Australia’ in Lin Crase (ed), Water Policy in Australia: The Impact of Change and Uncertainty (Resources for the Future, 2008) 67 (‘In the presence of variable and uncertain supplies of water, or other resources, it is natural for users to seek security of access. It is, of course, possible to guarantee access for some users; however, resources security is, in large measure, a zero-sum commodity. The more security is given to one group of users, the less there is for anyone else’.)
248 Department of Water, above n 64, 14-16.
**Law Reform Recommendation: A more flexible entitlements system**

The legislation should provide greater flexibility to adjust levels of groundwater extraction through:

- a new system of water access entitlements that provide access to a share of a consumptive pool rather than to a fixed volume of water, with the allocation of water to the entitlement to be made consistent with the relevant statutory water allocation plan; and
- pending the introduction of those entitlements, powers to more easily vary the volume of water that may be taken under existing licences.

### 6.4 Risk assignment and compensation

The new water resource management legislation should provide for how the risk of loss from entitlement reductions made by plan amendments is assigned between water users and government. In all Australian jurisdictions that have implemented the NWI a periodic adjustment to a consumptive pool, made in accordance with a statutory water plan, will apply equally to all entitlement-holders and is not compensable. However, permanent adjustments to the reliability of water access entitlements through plan amendments, either during the term of a plan or at the end of the plan term, raise more difficult questions of compensation. Water users who invest on the basis of a plan-defined entitlement may legitimately anticipate some security of entitlement during the term of the plan.

One approach put forward in the NWI, which has been adopted in some Australian jurisdictions, is to provide that reductions in water access associated with plan amendments or new plans may be compensable, depending on the reason for the new approach. Under these risk assignment provisions:

- risks associated with ‘seasonal or long-term changes in climate’ and ‘periodic natural events such as bushfires and droughts’ are borne by entitlement-holders;
- risks associated with changes in government policy, such as new environmental objectives, are to be borne by government;
- risks associated with improvements in the knowledge of water systems’ capacity to sustain particular extraction levels are to be shared by water users and governments in accordance with a formula specified in the NWI.251

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250 The NWI suggests that the risk assignment provisions should not apply to the initial statutory water allocation plans that transition to the new entitlements regime and address known over-allocation issues: Council of Australian Governments, above n 9 paras 46, 47. New South Wales adopted this approach by providing that its risk assignment provisions only apply to plan amendments or replacement plans (see *Water Management Act 2000* (NSW) ss 46). The Commonwealth takes a different approach, applying the risk assignment provisions to its first Basin Plan (see *Water Act 2007* (Cth) s75).

251 Ibid, paras 48-50. Under paragraph 49 of the NWI, the formula for risks associated with new knowledge is as follows: i) water access entitlement holders to bear the first 3% reduction in water allocation under a water access entitlement; ii) State/Territory governments and the Commonwealth Government to share one-third and two-thirds respectively reductions in water allocation under water access entitlements of between 3% and 6%; and iii) State/Territory and Commonwealth governments to equally share reductions in water allocation under water access entitlements greater than 6%. This only applies to ‘risks arising under comprehensive water plans commencing or renewed after 2014’.
One important point about these risk assignment provisions for present purposes is that there is no compensation for adjustments to the consumptive pool associated with ‘seasonal or long-term changes in climate’. On the face of it, this provides the flexibility needed to keep total water allocations within sustainable limits in a drying climate. However, as a number of commentators including the National Water Commission have noted, there are practical difficulties in attributing reductions, on a percentage basis, to climate, government policy and new knowledge.252

This ‘attribution problem’ is borne out by the limited practical experience with applying the NWI risk assignment provisions. The Commonwealth, New South Wales and Queensland that have incorporated the NWI risk assignment rules in their legislation.253 However to our knowledge only the Commonwealth, through the Murray-Darling Basin Authority and the Commonwealth Environment Minister, has actually attempted to apply the rules. The Authority’s difficulty in applying the risk assignment provisions is instructive. When faced with quantifying reductions due to new knowledge the Authority sought to ‘identify the baseline knowledge on upon which the Basin state water resource plans were prepared and to compare this with the information used for preparing the Basin Plan.’ The Authority said that it had ‘examined the information on current Basin state plans that is available to it, and found that it is not possible to make a valid comparison.’254

Given the practical difficulties with the NWI risk assignment rules, alternatives need to be considered. One alternative approach is to recognise that certainty is needed during the term of a plan, but a regular plan review at the end of the plan term is the opportunity for the community and the government to re-assess the long term sustainability of plan provisions of water for consumptive use and for environmental and other public benefit outcomes. The community and the government may then legitimately anticipate the capacity to re-set the plan regime without the burden of compensation unless the burden of entitlement reductions were to fall disproportionately on particular water users, so that water rights are effectively acquired for a public purpose identified in the new plan.

### Law Reform Recommendation: Risk assignment and compensation

In general, no compensation should be payable for permanent reductions in water allocations under water access entitlements associated with adjustments to consumptive pools by regular end of term plan review and amendment. The exceptions to the general rule are that compensation should be payable to water users who incur permanent reductions in entitlements made:

- by plan amendment during the term of the plan, or

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How does the Western Australian Government propose to address risk assignment and compensation in the new water resource management legislation? The 2013 Position Paper is not entirely clear, but does suggest that the new legislation will provide for compensation to be paid for reductions in the consumptive pool, depending on the reason for the reduction.255

We make one final point, which is less about compensation in a strict sense and more about adjustment assistance: it could be argued that water users who have lost access to water due to climate change should be assisted by an adaptation fund, funded by greenhouse gas emitters. This would acknowledge the links between those responsible for the emissions causing climate change and those who are suffering its harmful effects.256

6.5 Improved water accounting

The NWI envisages more precise measurement and management of water resources and greater transparency in water resources accounting. Water accounting is a regulated process that involves identifying, measuring, recording and reporting information about water.257 Key elements of the water accounting framework are improved measurement or metering of water resource extraction and transparent public reporting of the metering data. Metering is the most precise form of measuring water extraction, but cheaper proxy measures can be adopted.

In 2004, the NWI anticipated metering according to national technical standards in the circumstances where:258

(i) a water management plan requires metering,
(ii) where water access entitlements are traded,
(iii) where there are disputes over sharing of available water,
(iv) where new entitlements are issued, or
(v) where there is otherwise a community demand.

As a general practical proposition, licensing water access provides a convenient legal basis for imposing conditions that require metering and reporting of water extraction. In 2009, the National Water Commission stated that, ultimately, all surface and groundwater extractions should ‘licensed and metered or otherwise measured’.259 However, recognising the practical constraints on metering all groundwater extractions, it proposed that an interim risk-based approach be adopted by prioritising metering efforts where the level of water use was at or approaching full

255 Department of Water, above n 64, 24-25.
256 Gardner, Bartlett and Gray, above n 19, 630.
258 Council of Australian Governments, above n 9 para 87.
allocation or where the metering would enhance public confidence in compliance with the water resource management system, and where metering is otherwise cost effective.

It is not easy to ascertain the extent of metering of water licence extraction in Western Australia but it is a low proportion of licensees.\textsuperscript{260} Current policy is that a standard metering condition applies to licensees with an annual allocation greater than 500 ML, though metering may be required in some situations where the annual allocation is less than 500 ML.\textsuperscript{261} Metering is required as a pre-requisite to trading. The standard policy is that licensees should pay for the installation, maintenance, reading and reporting of meters. However, the State has paid, including with Commonwealth Water Smart funding, for the installation and maintenance of meters in trials to extend metering over priority areas of the State, especially Gnangara Mound.\textsuperscript{262} In 2009, the Department of Water published \textit{Strategic Policy 5.03 – Metering the taking of water, a Metering Implementation Plan}, and the \textit{Rights in Water and Irrigation (Approved Meters)} Order 2009 for the purpose of extending metering across the State to all licences with annual allocations greater than 50 ML, and with Government funded installation of meters in priority areas for licence entitlements of greater than 5 ML. The Gnangara Mound metering trial 2006-2010 showed significant benefits from metering in exposing high rates of unauthorised extraction that were gradually reduced, even though there was little legal enforcement action taken.\textsuperscript{263} Alas, Commonwealth funding for the metering program did not continue so the State retreated to its former (now current) policy requiring metering only for licences with annual allocations above 500 ML.\textsuperscript{264} The State can also gather groundwater data from the Groundwater Assessment Network of Monitoring Bores (approximately 2,300), most of which are in the South West and some of which are telemetered.\textsuperscript{265}

Overall, it is clear that the level of licence metering and reporting and the level of Departmental monitoring need to be greatly increased to obtain adequate information for groundwater modelling, planning and management. The Department of Water recognises this. It is investing in improved groundwater monitoring and proposes increasing the level of groundwater licence metering.\textsuperscript{266} In the 2013 Position Paper, the Department says that increased metering would be staged over a period of time, ensuring that:

\begin{itemize}
  \item \textsuperscript{260} Some figures are given by Madeleine Hartley, “Problematic governance of groundwater use efficiency on the Gnangara system, Perth”, (2013) \textit{Australian Environment Review} 496-500.
  \item \textsuperscript{261} Government of Western Australia, Department of Water, \textit{Securing Western Australia’s water future: Position paper – reforming water resource management}, September 2013, section 3.3.3, p.20.
  \item \textsuperscript{262} Government of Western Australia, Department of Water, \textit{Strategic Policy 5.03: Metering the taking of water}, June 2009, p.5 ff.
  \item \textsuperscript{263} Sarah Robertson, “A Regulatory Framework for Monitoring and Enforcement of Water Access Rights in Western Australia” UWA L Rev (forthcoming).
  \item \textsuperscript{265} Government of Western Australia, Department of Water, “Strategic Water Information and Monitoring Plan, Western Australia” June 2011, lodged with the Bureau of Meteorology, \url{http://www.bom.gov.au/water/regulations/fundingProgram/swimps.shtml}.
  \item \textsuperscript{266} “Strategic Water Information and Monitoring Plan”, ibid, p.76, and Department of Water, \textit{Securing Western Australia’s water future: Position paper – reforming water resource management}, September 2013, section 3.3.3.
\end{itemize}
within two years from mid-2014, all groundwater licences with annual allocations greater than 500 ML include a licence condition for metering, and

within five years, all groundwater licences and multi-user surface water licences with annual allocations of less than 500 ML will include a licence condition for measurement.

The proposed legislation will provide that all water access entitlements require metering, which will need to be implemented as statutory water allocation plans are adopted.

The design of legislation to implement these propositions is not difficult. Under the existing regulatory framework the Minister (or departmental delegate) may cause a meter to be installed, or require a licensee to install a meter. Once a meter has been installed the licensee must maintain the meter in good condition, pay the costs of repairs and testing, and not interfere with the meter. The legislation could also provide for the Department to recover the cost of providing metering if a licensee chose not to install, maintain and read a meter. The essence of the existing legislative provisions for metering could be incorporated into the reformed legislation with new provisions supporting metering of water access entitlements.

The key issue in extending metering has been the political assessment by the State Government and community interest groups of the costs and benefits of metering, including the costs and benefits of compliance and enforcement action if metering data shows unauthorised extraction. If meter readings provide evidence that water use exceeds licenced limits the current legislation gives the Minister (or departmental delegate) a number of enforcement options, including to:

- issue a direction ordering compliance with the licence condition;
- issue a notice suspending or cancelling the licence; or
- issue an infringement notices requiring payment of a modified penalty; or
- prosecute the licensee.

The enforcement regime could be strengthened by provisions that make it an offence for a licensee to fail to install a meter or report a meter reading contrary to licence condition as well as increasing the sanctions and penalties for unauthorised taking of water.

The real issue of reform is in the transparent public reporting of licence conditions requiring metering and of metering data. Presently, there is no publically accessible record of this information. The water register shows details identifying the licensee, the term of the licence, and the maximum annual allocation. Short of applying under the Freedom of Information Act 1992 (WA) and demonstrating that disclosure of the information is in the public interest, it is not possible

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267 Rights in Water and Irrigation Act 1914 (WA) sch 1 cl 46.
268 Rights in Water and Irrigation Act 1914 (WA) sch 1 cl 46(2)(a).
269 Rights in Water and Irrigation Regulations 2000 (WA) Part 4A.
271 Rights in Water and Irrigation Act 1914 (WA), sch 1, cl 18(1).
272 Rights in Water and Irrigation Act 1914 (WA), sch 1 cl 25(1) and (2)(c).
273 Rights in Water and Irrigation Regulations 2000 (WA), r 51.
274 Rights in Water and Irrigation Act 1914 (WA), s 5C.
for any person, even a neighbour, to discover whether a water licence is subject to a metering condition and whether the metering data show compliance with the licence entitlement. There is a strong case for the State to adopt an “information based regulation” approach and to make this information available through the on-line water register. Provision can be made for licensees to apply for water metering data not to be published if there are genuine and demonstrable concerns of commercial confidence. There is a very strong public interest in the transparent availability of water accounting data and the water resources legislation should reflect a presumption that the information is publically available unless a licensee can show good reasons for non-disclosure.

Law Reform Recommendation: Improved water accounting
The legislation should provide for:
- the implementation of increased metering as proposed by the 2013 Position Paper;
- a strengthening of enforcement provisions for non-compliance with licence conditions requiring metering and reporting; and
- reform of the provisions for the water register to mandate on-line publication of licence conditions for metering and of the metering data unless the licensee can show a good reason for non-disclosure.

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7. Greater use of water markets

7.1 Water markets and climate change adaptation

A number of commentators have identified the value of water markets in promoting productive and efficient water use, particularly under conditions of water scarcity. As Skurray explains:

The expected benefits of trading in water, or in water entitlements, include the promotion of both physical and economic efficiency in water use, the former through price signals, and the latter through improved flexibility in the allocation of the resource among uses and locations. These benefits are particularly desirable in contexts of full- or over-subscription of available water resources.277

The Garnaut Climate Change Review, National Water Commission and a number of academic commentators have identified water markets as an important climate change adaptation mechanism.278 The National Water Commission, for example, has highlighted the benefits of water markets in reallocating water to more productive uses in a climate change context:

Water markets have proven to be effective in reallocating water to its highest valued use, particularly during severe droughts. Because climate change is likely to lead to both rapid and cumulative changes in the supply of and demand for water, water markets will be an important adaptation mechanism to ensure that maximum value is obtained from Australia's scarce water resources.279

The experience of water trading in the Murray Darling has been cited as an example of the ability of water markets to reduce the economic impact of droughts. The National Water Commission concluded, based on economic modelling, that water trading in the southern Murray Darling Basin reduced the impact of drought over a five year period from $11.3b to $7b.280

We accept that water markets have the potential to play an important role in promoting productive and efficient water use in a drying climate. This chapter considers the potential for regulatory reforms to promote the effective use of water markets in two areas: the initial allocation of groundwater and groundwater trading.

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279 National Water Commission, above n 190.

7.2 Allocating groundwater

Limitations of the current regulatory system

There are a range of different approaches that can be taken to the allocation by government of rights to extract groundwater. These include:

- A **first-in, first-served approach**, under which licence applications are decided individually in the order in which they are received;
- A **merit selection approach**, under which government assesses the relative merits of water uses proposed by multiple applicants after a call for expressions of interest; or
- A **market-based approach**, under which the person who is willing and able to pay the most gets access to the groundwater resource.

As will be clear from our outline of the licensing process in Chapter 1, the **RIWI Act** is best suited to the first approach, which has in fact been the dominant one to date.

The **RIWI Act** does not provide effectively for a merit selection approach. It is true that the Minister (or delegate) must have regard to whether the grant of a licence application will ‘prejudice other current and future needs for water’,²⁸¹ but this is not the same as calling for expressions of interest and ranking applicants on a merit basis. There is no provision in the Act to place the usual licensing process on hold and call for expressions of interest in this way.

The **RIWI Act** does not provide effectively for a market-based approach either. It does provide that the Minister may, in some circumstances, enter into an agreement to grant a licence in return for payment of an agreed amount.²⁸² However, it is not clear what methods can be used to determine the amount of this payment,²⁸³ and there is no process to place the ordinary license application process on hold to allow an auction or other market-based release of water to take place.

Notwithstanding these limitations, the Department has indicated in a number of statutory plans that it may allocate water in the future using merit selection, sale, auction or tender – and as we shall see it has in fact used merit selection processes. These approaches to allocating water do not have a strong foundation under current law.

**Allocating groundwater in the South West: the experience to date**

To date no groundwater has been released through a market-based approach. The dominant practice in the South West has been to use water plans to reserve water for public water supply, and then use water licensing to allocate the remaining ‘licensable component’ for free on a first-in, first-served basis. There have, however, been limited experiments with merit selection in the South West. The following case studies provide examples of these ‘first-in, first-served’ and merit selection approaches respectively.

²⁸¹ **Rights in Water and Irrigation Act 1914** (WA) sch 1, cl 7(2)(d).
²⁸² **Rights in Water and Irrigation Act 1914** (WA) sch 1, cl 40.
²⁸³ Compare **Rights in Water and Irrigation Act 1914** (WA) sch 1, cl 41(3) which, unlike cl 40, specifically provides that ‘the amount to be paid by consideration may be established by public auction or tender or private treaty’; see Vivian Chung, ‘Making Waves: An Overhaul of Western Australia’s Legislative Framework for the Allocation of Water - Part II’ (2007) 26(4) Australian Resources and Energy Law Journal 381-390.
Case Study: Groundwater allocation in Mingenew, Arrowsmith Groundwater Area\textsuperscript{284}

Mingenew is a wheat and sheep farming area in the northern wheatbelt, around 90km south-east of Geraldton. Approximately 140km to the east of Mingenew is the Karara iron ore mine, a joint venture between an Australian iron ore company and China’s second-biggest iron ore producer, Ansteel.

In or about 2010 this joint venture, through Karara Mining Limited (Karara), applied to the Department of Water for a licence to take 5.3GL/yr of groundwater from the Leederville-Parmelia aquifer beneath Mingenew, in order to transport the water by pipeline to its mine for use in magnetite processing. A local farmer agreed to provide access to his land for the purpose of constructing a well and taking the water.

The grant of the Karara application would mean that the groundwater resource in question would be fully allocated (Table 12).

<table>
<thead>
<tr>
<th>Allocation limit (GL/yr)</th>
<th>Public water supply (GL/yr)</th>
<th>Exempt unlicensed (GL/yr)</th>
<th>Licensable component (GL/yr)</th>
<th>Existing licences (GL/yr)</th>
<th>Available for licensing (GL/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2</td>
<td>2</td>
<td>0.04</td>
<td>6.16</td>
<td>0.84</td>
<td>5.32</td>
</tr>
</tbody>
</table>

One of the issues that became significant in dealing with the application was whether a ‘first-in first-served’ policy should be applied. On this issue the Arrowsmith Groundwater Allocation Plan (2010) states that:

\textit{The department applies the first-in first-served approach to assessing applications for a water licence. Where a resource approaches the allocation limit, (generally where less than 30% of the licensable component remains to be allocated for licensing) the department may consider alternative mechanisms to the first-in first-served approach.}

\textit{The alternative mechanisms to the first-in first-served approach will be applied at the department's discretion, using one of the following approaches:}
\begin{itemize}
  \item merit select
  \item sale, auction or tender process
  \item other methods as determined by the department
\end{itemize}

\textsuperscript{284} Material for this case study is drawn primarily from Department of Water, above n 32 (Arrowsmith Groundwater Allocation Plan); Department of Water, ‘Arrowsmith Groundwater Allocation Plan: Evaluation Statement 2010–2011’ (2011) and media reports.

\textsuperscript{285} Department of Water, above n 31 (Arrowsmith Groundwater Allocation Plan) 10; the figures for existing licences were supplied by the Department of Water.
The 'alternative mechanisms' identified in the *Arrowsmith Groundwater Allocation Plan* were not used. After a public consultation period, the Minister granted a 5 year, 5.0GL/yr licence to Karara on 31 August 2011. While no reasons for this decision were published, public comments by the Minister suggest that he felt compelled to grant the licence due to the ‘first-in first-served’ policy. A review of that policy was announced in the month following the licence decision.

The decision to grant the licence to Karara was criticised by local farmers. One was quoted as saying ‘Any idea of a groundwater based enterprise has now been nipped in the bud and it will remain that way for the life of that mine which is the next 30 years or so’. Another questioned whether the proposed use was appropriate: ‘we don’t have any gripe with mining companies doing what they do, but what we are very concerned about is the use of very scarce fresh water to basically wash rocks.’ As there are no third party appeals under the *RIWI Act* these farmers could not appeal from the grant of the licence.

The pipeline has been constructed, and water extracted and used in magnetite processing. Karara intends initially to use approximately 3GL/yr of its licensed 5 GL/yr based on its planned Stage One production rate. It is expected that the project will require an additional 11.2 GL/yr for future expansion over the 30 to 40 year project life.

Without expressing a view on the relative value of mining versus agriculture, the Mingenew case study does highlight the problem acknowledged by the Department of Water in its discussion paper on the ‘first-in first-served’ policy: because water is allocated for free to the first person to apply for it, it is not necessarily allocated to its best use. This may not matter much when water resources are plentiful, but as the Department has acknowledged it is becoming increasingly important in the South West in the face of the twin pressures of climate change and increasing demand.

If the first-in first-served approach has had its difficulties, so too has the experiment with a merit-based selection process used in the Gingin Groundwater area, as the following case study shows.

**Case study: Merit-based selection process, Gingin Groundwater Area**

The Gingin Groundwater Area is located between 40 km and 150 km north of Perth and covers an area of about 6147 km. As competition for Gingin’s groundwater increased the Department, together with the Gingin Water Resources Advisory Committee, developed a merit selection approach to granting water licences.

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288 above n 286.
290 Karara Iron Ore Project, ‘Water Licence Granted to Karara Project’ (Media Release) 1 September 2011.
291 Department of Water, ‘Capacity of water resources in the Mid West to meet mining and industrial growth’ (2011), 28.
292 Department of Water, above n 287, 3-4.
An interim allocation plan published in 2002 outlined the elements of this approach:

- A conventional ‘first-in, first-served’ approach would apply until a resource is 90% allocated
- When the 90% allocation limit is reached the Department will call for expressions of interest and licence applications
- If the water sought in the applications exceeds the allocation limit, the applications will be assessed by the Gingin Water Resources Advisory Committee using the merit selection process.\(^{293}\)

The merit selection process itself involved ranking each expression of interest against economic, social and environmental criteria.\(^{294}\) The merit selection process was followed, and applications ranked against the criteria.\(^{295}\)

Subsequent commentary by the Department of Water, and by a consultant engaged by the Department, suggests that this trial of a merit-based selection process was not successful. The consultant, Marsden Jacobs, stated that:

The Merit Selection approach was used by DoW in Gingin with limited success. The main disadvantages of the approach were the difficulty in defining strict criteria for the merit selection process and having the right skills and resources to assess the applications against these criteria. A further difficulty was the subjective nature of the criteria, which were open to differing interpretations.\(^{296}\)

The Department’s comments, which we take to be drawing on the Gingin experience, were as follows:

Developing an agreed set of criteria that take into account all relevant factors is challenging. All relevant stakeholders must be identified and considered in determining the criteria. As a result, the criteria tend to be narrowly focused (advantaging particular stakeholder groups), or relatively broad (making evaluation highly subjective).

Evaluating applications is subjective and technically complex. The subjective nature of the evaluation makes the outcome susceptible to appeal and legal challenge, creating investment uncertainty.

Due to the difficulties in implementing the merit selection method, the approach is considered the most costly and challenging to implement. The department’s experience with merit based selection confirms these practical difficulties.

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\(^{294}\) The criteria will be summarised in the final report. The authors have requested, but not yet obtained, these criteria.

\(^{295}\) We have assumed this is the case based on the limited information currently available to us. The final report will contain more detail on the process.

The Gingin case study illustrates that while merit-selection has the benefit of at least trying to direct water to higher value uses, there are practical problems with seeking to rank potential licence applicants.

**Market-based mechanisms for release of groundwater in other jurisdictions**

Legislation in most other Australian jurisdictions authorise a range of approaches to groundwater allocation, including the use of market-based mechanisms. The following case study provides an example of one market-based mechanism: the use of auctions to allocate groundwater.

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**Case Study: Auction of Water Licences in the Great Artesian Basin, NSW (2009)**

Groundwater in the Great Artesian Basin became available for allocation due to water savings from the ‘Cap and Pipe the Bores Program’ and a policy decision to allocate 30% of saved water to new or existing users.

Under the *Water Management Act 2000* (NSW), the Minister may declare, by order published in the *Government Gazette*, that the right to apply for a water licence is ‘to be acquired by auction, tender or other means specified by the order’ (s65).

In November 2008 the NSW Minister for Water, Hon. Phillip Costa MP, signed the Controlled Allocation of Access Licences Order for the NSW Great Artesian Basin Groundwater Sources.

The objectives of the auction were to:
- make access licences available to new or existing water users
- stimulate trade in the NSW Great Artesian Basin Groundwater Sources
- establish a market value for entitlements in the NSW Great Artesian Basin Groundwater Sources
- provide an equitable opportunity to potential purchasers of the water.

The auction was held in July 2009. All 24 access licences that were available for auction, which collectively authorised the extraction of 2,718 ML, were sold within 75 minutes.

A post-auction report suggested that 60% to 70% of the water purchased will be used to support tourism, and the balance to support intensive industries such as feed lotting.

The average price paid was $725/ML. The auction revenue of $870,000 was reinvested in the Cap and Pipe the Bores Program.

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297 Gardner, Bartlett and Gray, above n 19, 464; Chung, above n 283.

Proposals for regulatory reform

The 2013 Position Paper proposes that the new legislation will provide broad powers to allocate water:

It is proposed that the new legislation allow for unallocated water to be granted by various mechanisms, including FIFS [first-in, first served], competitive submission according to certain criteria which may not involve payment for the water, market mechanisms or other suitable means. The method of releasing unallocated water will vary across the state taking into account the resource characteristics, the level of demand, and community and industry requirements. Local advisory groups would play a role in determining suitable mechanisms.

This ‘all of the above’ approach to allocation mechanisms to allow for a flexible approach is difficult to criticise for an Act that is likely to be in place for decades across very different water resources. However, there remains a fundamental question posed by conditions in the South West: whether, in a drying climate and with increasing water demand, groundwater should continue to be free.

Certainly national policy principles would favour increased use of market mechanisms such as auctions. Such an approach is also more likely than the first-in, first-served approach to allocate water to its highest use: as the Department has noted, ‘preparedness to pay is the best (albeit imperfect) guide to productivity.’ By putting a price on water, the use of market-based mechanisms, such as auctions, tenders or direct sales would also provide a signal of water scarcity and promote more efficient water use.

Law reform recommendation: Allocation of groundwater through market-based mechanisms

The new water resource management legislation should provide a firm legal basis for the release of unallocated water through a range of mechanisms, including market-based mechanisms such as auctions. Market-based mechanisms should be considered the default approach for heavily allocated groundwater resources.

This raises the question of what should be done with revenue from the use of auctions and other market-based mechanisms. The Water Reform Implementation Committee recommended that this revenue be directed to water resource management. As we have seen, this approach was adopted in the Great Artesian Basin case study. The advantages of this approach are that it would build support for the introduction of market-based mechanisms and provide much-needed funding for water resource management.

Law reform recommendation: Use of revenue from groundwater allocation

The revenue from the release of groundwater through auctions and other market-based

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299 Department of Water, above n 286, 23.
300 Water Reform Implementation Committee, above n 100, 12. See also the government response of February 2007, which appeared to accept the recommendation, at least in respect of revenue from tenders: Government of Western Australia, ‘Government Response to a Blueprint for Water Reform in Western Australia’ (2007), 9.
mechanisms should be directed to water resource management.

As we have noted previously, there is a tension between concepts of ‘equity’ and ‘efficiency’ in water allocation. Market-driven allocation mechanisms such as auctions may allocate water to their most economically productive use, but this is not necessarily the same thing as the best use of that water. One regulatory option would be to reserve water for a particular use where there is a clear public interest in doing so, but then to allocate that water to suitable water users through market-based mechanisms. For example, water reserved for public water supply could be sold to the Water Corporation by direct sale, or groundwater reserved for a horticultural precinct could be auctioned to horticulturalists. We recognise that there is room for debate on whether reservation of water is a good idea, and if so when it should be used, but recommend that the new water resource management legislation should at least keep open the option of reserving water through statutory water allocation plans.

Law reform recommendation: Reservation of groundwater

The new water resource management legislation should provide that statutory water allocation plans may reserve water for specified purposes.

7.3 Trading groundwater

Trading groundwater in the South West: the experience to date

As we outlined in Chapter 1, the RIWI Act was amended in 2001 to provide for trade in water entitlements. Trade can take place by transferring the whole of a licence to another person; transferring part of the volumetric water entitlement under a licence to another person; or by entering into a short-term lease of water from a licence-holder.

There have been a number of trades since 2001. Table 12 provides an overview of groundwater trade in the South West since 2007, and Appendices G and H provide more detail. Unfortunately the data does not identify what proportion of the transfers in Table 12 were trades of water separate from land, as opposed to the more traditional transfer of a water licence on the sale of land. However the figures do suggest that there is an increasing trade in groundwater in the South West over and above trade associated with the sale of land.

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301 See for example Economic Regulation Authority, above n 198, 28 (arguing against the practice of reserving groundwater for public water supply on the basis that the Department ‘may inadvertently reserve a water resource that has a higher value alternative use’).
Table 12: South-west groundwater trade 2007-08 to 2012-13

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of transfers</th>
<th>Volume of transfers (ML)</th>
<th>Number of leases</th>
<th>Volume of leases (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>14</td>
<td>486</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>2008-09</td>
<td>62</td>
<td>2 115</td>
<td>11</td>
<td>292</td>
</tr>
<tr>
<td>2009-10</td>
<td>73</td>
<td>10 218</td>
<td>7</td>
<td>182</td>
</tr>
<tr>
<td>2010-11</td>
<td>65</td>
<td>16 632</td>
<td>9</td>
<td>4 551</td>
</tr>
<tr>
<td>2011-12</td>
<td>60</td>
<td>6 455</td>
<td>27</td>
<td>4 166</td>
</tr>
<tr>
<td>2012-13</td>
<td>103</td>
<td>33 276</td>
<td>44</td>
<td>5 739</td>
</tr>
<tr>
<td>TOTAL</td>
<td>377</td>
<td>69 182</td>
<td>99</td>
<td>14 963</td>
</tr>
</tbody>
</table>

In a detailed study of groundwater trading in the Gnangara system, Skurray, Randit and Pannell identified a number of impediments to groundwater trade. These include:

- the ‘weakness of property rights to groundwater use’, including their time-limited nature and the power of the Minister to amend a licence;
- the ‘licence eligibility’ requirement in the RIWI Act, which will ordinarily mean that the purchaser must usually own or occupy the land on which the water is to be used;
- the transactions costs associated with a detailed assessment by the Department of each proposed trade; and
- the lack of published information on market prices and potential sellers.

We would like to build on this research, in our final Report, by including case studies of groundwater trades in the South West, or of cases in which trades were considered but did not proceed. We are particularly keen to include case studies which have lessons for how the regulatory framework could better promote productive and efficient water use. If you know of any case studies of this kind we would be grateful if you could contact us.

Groundwater trading in other jurisdictions

The following case study provides an example of groundwater trading in New South Wales, which has the highest volume of groundwater trade in Australia.

Interstate Case Study: Lower Murrumbidgee Groundwater Sources, South Western NSW

Of all Australian jurisdictions, NSW has the greatest activity in temporary and permanent groundwater trading. The majority of the trade, some 75% by volume, occurs in the Lower Murrumbidgee Deep, Lower Murray and Lower Lachlan aquifers.

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302 Skurray, Pandit and Pannell, above n 287.
This trade occurs under the framework of the Water Management Act 2000 (NSW) and the water planning and other legislative instruments made under that Act. For the Lower Murrumbidgee this includes the Water Sharing Plan for the Lower Murrumbidgee Groundwater Sources 2003 (WSP Lower Murrumbidgee 2003). It is supported by the gazetted Implementation Program for the major inland alluvial groundwater Water Sharing Plans February 2010 that sets milestones for delivery on the Plan’s objectives. Although there was some trade before the commencement of the plan, the WSP has enabled permanent trading of water entitlements.

The Lower Murrumbidgee Deep Groundwater Source (as distinct from the shallow groundwater sources where there has not been much trading) has a system area of 31,372 km², a system thickness of 100 to 300m, and an annual recharge of 335 000 ML. The extraction limit varies each year but averages 270 000 ML plus water made available under basic landholder water rights and under supplementary water access licences. Planned environmental water is 65,000 ML/yr. Approximately 340 production bores access this groundwater source, using the water for irrigation and town supply with access permitted under local water utility (2210 ML), domestic and stock (324 ML), aquifer (267,777 ML) and supplementary water access licences (41,196 ML). All bores are metered.

The Act’s provisions set the overarching rules for water trades or dealings with aquifer access licences and the WSP Lower Murrumbidgee 2003 provides more specific rules for the particular water source, together providing clear processes for managing aquifer entitlements with a high degree of certainty.

For example, the access licence dealing rules under the WSP Lower Murrumbidgee 2003 impose various constraints on dealings or trades within a groundwater source e.g. relating to conversion of an access licence category, water allocation assignments between water sources, and to interstate access licence transfer or assignment of water allocations. They allow for permanent trades that include changes to access licence shares or to change an extraction location, and temporary trades that include changes in the volume of water held in an account.

All dealings must be consistent with the Plan’s rules, including local management area rules, which have been developed to manage localised drawdowns on groundwater levels, and which do not permit trading outside or between local management areas.

There are also requirements for some level of hydrogeological assessment of the impacts of proposed trading applications. These are carried out by the NSW Office of Water (NOW) with a fee payable by the applicant as determined by the State’s economic regulator IPART. The Office is also responsible for monitoring groundwater levels of 246 bores at 108 sites for deep and shallow groundwater sources.

Data on the types, numbers and trade volume, in addition to other licensing information is publicly available at http://registers.water.nsw.gov.au. A small sample is set out below confirming that the Lower Murrumbidgee Deep Groundwater Source has the highest level of groundwater trading of any of these inland alluvial groundwater sources.
<table>
<thead>
<tr>
<th>Year</th>
<th>Temporary Dealings (Assignment of water allocations between access licences s71T WMA)</th>
<th>Permanent Dealings (Assignment of rights under access licence s71Q QMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Volume (ML)</td>
<td>Number</td>
</tr>
<tr>
<td>2007 – 08</td>
<td>190</td>
<td>8</td>
</tr>
<tr>
<td>2008 – 09</td>
<td>291</td>
<td>16</td>
</tr>
<tr>
<td>2009 – 10</td>
<td>222</td>
<td>9</td>
</tr>
<tr>
<td>2010 – 11</td>
<td>35</td>
<td>5</td>
</tr>
<tr>
<td>2011 - 12</td>
<td>41</td>
<td>3</td>
</tr>
</tbody>
</table>

Proposals for regulatory reform

The 2013 Position Paper acknowledges that ‘current arrangements do not foster efficient and effective trade’ and proposes four reforms:

- to simplify the assessment process, so that applications for trades that represent a low risk to the water resource, other water users or the environment will not be required to undergo the full assessment process;
- to include generic, state-wide trading rules in the new legislation, such as a rule that requires metering to be in place before trading can occur; and
- to make traded volumes and prices publicly available to ensure that buyers and sellers have sufficient information to make informed decisions
- to provide prospective buyers with limited contact details of licensees to facilitate contact between buyers and sellers.\(^{303}\)

These measures, together with the proposal for perpetual water entitlements, go a long way to addressing the barriers to groundwater trade identified by Skurray, Randit and Pannell. Clearly, much will depend on the design of trading rules, whether they are state-wide rules in the legislation or more area-specific rules in statutory water plans.\(^{304}\) However these proposals would be a good start in reducing trading transaction costs and bringing buyers and sellers together.

One issue that isn’t addressed in the 2013 Position Paper is whether the ‘landholder licence eligibility’ requirement will be retained in the new Act. This requirement seeks to ensure that a person who obtains a water entitlement has the capacity to make beneficial use of the water right; that is, the person has legal access to the land from which the water will be taken and to the land where the water will be used. This restriction was included to avoid speculative acquisition of water entitlements,\(^{305}\) but has the collateral effect of excluding other prospective water purchasers, such as businesses that wish to acquire a portfolio of...

\(^{303}\) Department of Water, above n 64, 11-12.
\(^{304}\) For example the rule that groundwater cannot be traded between management sub-areas has been a substantial constraint on trade in the Gnangara system: Skurray, Pandit and Pannell, above n 277, 16.
\(^{305}\) Government of Western Australia, above n 80, 79 (‘The list of people eligible to hold licenses has been carefully drafted to avoid speculation in licences once trading has been introduced’).
water entitlements for leasing, or investors acquiring a water entitlement before acquiring land title,\[^{306}\] or non-government ‘water trusts’ that wish to purchase water entitlements to maintain environmental values.\[^{307}\] While there are other policy arrangements to address the second and third situations, the landholder eligibility criterion for licensees does preclude the investment in water entitlements for leasing purposes, which could be a beneficial arrangement in a developed area with an operating water market that would likely regulate excessively speculative investment in water entitlements. On the other hand, in an undeveloped area with no operating water market, there may be merit in retaining the landholder eligibility requirement with a beneficial use assessment to dampen speculative investment in water entitlements, especially if water entitlements are granted at no cost.\[^{308}\]

One final point to note is the important relationship between trading and the use of market based mechanisms to release unallocated water. In areas that are not fully allocated it would not make much sense to pay for a water trade when you can apply to get unallocated water for nothing. If the alternative is to purchase water in an auction, however, there is a greater incentive to trade. Thus the recommendations we have made above concerning increased use of market-based mechanisms to release unallocated water would also support greater trading of water entitlements.

### Law Reform Recommendations: Water Trading

The legislation should be designed to facilitate trade in groundwater entitlements, including through implementation of the reforms outlined in the 2013 Position Paper. Consideration should also be given to removing the requirement that a purchaser of an entitlement in a highly or fully allocated area must be an owner or occupier of the land from which the water will be taken and on which it will be used.

---

\[^{306}\] James H. Skurray, Ram Pandit and David J. Pannell, ‘Institutional impediments to groundwater trading: the case of the Gnangara groundwater system of Western Australia’ (2013) 56(7) Journal of Environmental Planning and Management 1, p13. This issue is effectively solved in Western Australia by Rights in Water and Irrigation Act 1914 (WA) Schedule 1, cl.9.


\[^{308}\] By way of comparison, there are case examples of where large speculative water licence applications were refused because it was apparent that the applicant could not make beneficial use of the amount of water applied for: De Tournouer v Chief Executive, Department of Environment and Resource Management [2009] QCA 395; Niebieski Zamek Pty Ltd v Southern Rural Water (No 2) [2003] VCAT 223.
8. Other issues

8.1 Regulation of managed aquifer recharge

Managed aquifer recharge (‘MAR’) is the purposeful recharge of aquifers for subsequent recovery or environmental benefit.\(^\text{309}\) MAR using waste water or stormwater is becoming increasingly important in the drying climate of the South West. However, this innovative solution raises new challenges in urban water resource management because it departs from the traditional linear paradigm of extracting pristine natural water from protected catchment areas for water supply and discharging waste water after human use. While we recognise that MAR raises important issues of regulatory reform, some of which are considered in the 2013 Position Paper, we don’t propose to deal with those issues here. This is because these issues are being separately considered, in work led by Alex Gardner, as part of a project being conducted for the CRC for Water Sensitive Cities.

8.2 Administrative reforms

The Mingenew case study (section 7.3) is a reminder of the strong institutional bias in the RIWI Act in favour of licence applicants. The licence application process requires the Minister (or delegate) to consider the needs of current and future water users, but those raising concerns on those matters (such as the farmers in the Mingenew case study) have very few rights. In particular, they have no right to receive reasons for decision that explain how their objection was dealt with and, in contrast with the license applicant, no right to appeal from the license decision.

There is a strong case for two basic reforms to the RIWI Act:

- introduce a requirement that the Minister (or delegate) must publish reasons for his or her decision on a licence application, so that objectors to a licence know whether their concerns have been properly considered.\(^\text{310}\)

- remove the institutional bias in favour of licence applicants by either
  - introducing third party appeals; or
  - removing applicant appeals.

The introduction of third party appeals would bring Western Australia into line with most other states (see Table 12).

\(^{309}\) MAR is the purposeful recharge of aquifers for subsequent recovery or environmental benefit: P Dillon et al, 'Managed aquifer recharge: rediscovering nature as a leading edge technology' (2010) 62(10) Water Science and Technology 2338, 2339.

\(^{310}\) Compare, for example, s 71C(3) of the Water Act (NT), which provides, in relation to water extraction licence decisions, that a copy of the full decision must be available to the public. It also provides that the decision must include the reasons for the decision, the way in which comments on the application were dealt with, and how factors specified in the legislation were taken into account.
Table 12: Availability of third party appeals against decisions to grant water licences in Australia

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Can third parties appeal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>No.(^\text{311})</td>
</tr>
<tr>
<td>NSW</td>
<td>Yes - person who has objected to the grant may appeal.(^\text{312})</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>Yes - a person aggrieved by the grant may appeal.(^\text{313})</td>
</tr>
<tr>
<td>Queensland</td>
<td>Yes - person who has made a submission on the application may appeal.(^\text{314})</td>
</tr>
<tr>
<td>South Australia</td>
<td>No - capacity to provide for third party appeals through regulations, but no such regulations have been made.(^\text{315})</td>
</tr>
<tr>
<td>Tasmania</td>
<td>Yes - person who has made representation concerning application may appeal.(^\text{316})</td>
</tr>
<tr>
<td>Victoria</td>
<td>Yes - a person whose interests are affected by the grant may appeal.(^\text{317})</td>
</tr>
<tr>
<td>WA</td>
<td>No.(^\text{318})</td>
</tr>
</tbody>
</table>

The removal of applicant appeals, so that the applicant and third parties would only have access to judicial review of the legality (as opposed to the merits) of the licensing decision is not an approach used in other Australian water legislation, but is used in some other contexts – for example a developer that is refused permission to carry out a ‘controlled action’ assessed under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) has no access to a merits appeal.

\(^{311}\) Water Resources Act 1997 (ACT) s 94, sch 1.
\(^{312}\) Water Management Act 2000 (NSW) s 368(1)(b). Note, however, that the right to object to a water access licence is restricted: a person cannot object where a statutory ‘water sharing plan’ is in place: Water Management Act 2000 (NSW) s 62(1)(n).
\(^{313}\) Water Act (NT) s 30.
\(^{314}\) The provisions are somewhat convoluted. An ‘interested person’ may apply for internal review of decision: Water Act 2000 (Qld) s 861. An ‘interested person’ is ‘[a] person who has been given an information notice or a compliance notice by the chief executive, or an authorised officer appointed by the chief executive’: s 851. The chief executive officer is required to give an information notice to ‘any person who gave a properly made submission about the application’: s 211(3). Note that a ‘properly made submission’ must, among other things, be ‘made by a person invited to make the submission’: sch 4 (emphasis added). Presumably a public notice calling for submissions is considered an ‘invitation’ for the purposes of this definition: see s 208.
\(^{315}\) Natural Resource Management Act 2005 (SA) s202(1)(b).
\(^{316}\) Water Management Act 1999 (Tas) s 270(b).
\(^{317}\) Water Act 1989 (Vic) s 64(1)(b); Niebieski Zamek Pty Ltd v Southern Rural Water [2003] VCAT 223 (25 February 2003) at para 68. Note that s64(1)(b) relates to water licences; third party appeals are not available concerning the grant of water shares: Water Act 1989 (Vic) s 33AX.
\(^{318}\) Rights in Water and Irrigation Act 1914 (WA) S 26 GG(2).
**Appendix A**

**Extract from Arrowsmith Groundwater Allocation Plan**

<table>
<thead>
<tr>
<th>Subarea</th>
<th>Aquifer</th>
<th>Allocation limit $\text{kL/yr}$</th>
<th>Unlicensed components</th>
<th>Licensable component</th>
<th>Status of water availability for licensing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Public water supply reserve $\text{kL/yr}$</td>
<td>Exempt unlicensed $\text{kL/yr}$</td>
<td>General licensing $\text{kL/yr}$</td>
<td></td>
</tr>
<tr>
<td>Allanooka</td>
<td>Yarragadee</td>
<td>28,800,000</td>
<td>8,000,000</td>
<td>300,000</td>
<td>20,500,000</td>
</tr>
<tr>
<td>Darling</td>
<td>Cattamarra</td>
<td>(400,000)</td>
<td>0</td>
<td>0</td>
<td>(400,000)</td>
</tr>
<tr>
<td></td>
<td>Eneabba</td>
<td>(400,000)</td>
<td>0</td>
<td>0</td>
<td>(400,000)</td>
</tr>
<tr>
<td></td>
<td>Lesueur</td>
<td>1,400,000</td>
<td>0</td>
<td>0</td>
<td>1,400,000</td>
</tr>
<tr>
<td></td>
<td>Leederville - Parmelia</td>
<td>(100,000)</td>
<td>0</td>
<td>0</td>
<td>(100,000)</td>
</tr>
<tr>
<td></td>
<td>Surficial</td>
<td>2,500,000</td>
<td>0</td>
<td>350,000</td>
<td>2,150,000</td>
</tr>
<tr>
<td></td>
<td>Fractured rock</td>
<td>Not applicable</td>
<td>0</td>
<td>240,000</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Dongara</td>
<td>Yarragadee</td>
<td>(200,000)</td>
<td>0</td>
<td>0</td>
<td>(200,000)</td>
</tr>
<tr>
<td></td>
<td>Cattamarra</td>
<td>(200,000)</td>
<td>0</td>
<td>0</td>
<td>(200,000)</td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>8,000,000</td>
<td>0</td>
<td>370,000</td>
<td>7,630,000</td>
</tr>
<tr>
<td></td>
<td>Yarragadee</td>
<td>4,500,000</td>
<td>0</td>
<td>750,000</td>
<td>3,750,000</td>
</tr>
</tbody>
</table>

1 Allocation limits shown in brackets are an estimate only. Applications to obtain water from these aquifers will require a comprehensive hydrogeological investigation before the water can be allocated. Contact the Mid West Gascoyne regional office in Geraldton for more information.

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319 Department of Water, above n 32, 10, 11.
### South-west groundwater plans

**Non-Statutory Plans**

<table>
<thead>
<tr>
<th>Plan Name</th>
<th>Proclaimed groundwater area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gnangara Groundwater Areas Allocation Plan (2009)</td>
<td>Gingin (south of Gingin Brook)</td>
</tr>
<tr>
<td></td>
<td>Gnangara</td>
</tr>
<tr>
<td></td>
<td>Yanchep</td>
</tr>
<tr>
<td></td>
<td>Wanneroo</td>
</tr>
<tr>
<td></td>
<td>Mirrabooka</td>
</tr>
<tr>
<td></td>
<td>Gwelup</td>
</tr>
<tr>
<td></td>
<td>Perth</td>
</tr>
<tr>
<td></td>
<td>Swan</td>
</tr>
<tr>
<td>South West Groundwater Areas Allocation Plan (2009)</td>
<td>Bunbury Busselton–Capel</td>
</tr>
<tr>
<td></td>
<td>Blackwood</td>
</tr>
<tr>
<td></td>
<td>South West Coastal</td>
</tr>
<tr>
<td>Upper Collie Water Allocation Plan (2009)</td>
<td>Collie</td>
</tr>
<tr>
<td>Murray Groundwater Allocation Plan (2012)</td>
<td>Murray</td>
</tr>
</tbody>
</table>

**Draft Non-Statutory Plans**

<table>
<thead>
<tr>
<th>Plan Name</th>
<th>Proclaimed groundwater area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gingin Groundwater Allocation Plan (2013)</td>
<td>Ginger</td>
</tr>
</tbody>
</table>

**Proclaimed South West groundwater areas without plans**

- Albany
- Dwellingup
- Jandakot
- Rottnest
- Serpentine

---

80
## Evaluation Statements for South West Groundwater Plans

<table>
<thead>
<tr>
<th>Non-Statutory Plans (publication date)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockburn (December 07)</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>√</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Kemerton (December 2007)</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Rockingham-Stakehill (November 2008)</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>√</td>
<td>(08-11)</td>
<td>x</td>
</tr>
<tr>
<td>Gaurangara (November 2009)</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>√</td>
</tr>
<tr>
<td>South West (May 2009)</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>√</td>
</tr>
<tr>
<td>Upper Collie (August 2009)</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Arrowsmith (August 2010)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
<td>√</td>
<td>(10-11)</td>
</tr>
<tr>
<td>Jurien (August 2010)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
<td>√</td>
<td>(10-11)</td>
</tr>
<tr>
<td>Murray (May 2012)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>x</td>
</tr>
</tbody>
</table>
## Treatment of climate change in South West groundwater allocation plans

<table>
<thead>
<tr>
<th>Plan</th>
<th>Proclaimed groundwater area</th>
<th>Treatment of climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockburn Groundwater Area Allocation Plan (2007)</td>
<td>Cockburn</td>
<td>Noted that climate change may lead to reductions in allocation limits in the future. Average rainfall over ‘last 28 years’ (1968-2006) used in calculating allocation limits (p63).</td>
</tr>
<tr>
<td>Kemerton Groundwater Subareas Water Management Plan (2007)</td>
<td>Bunbury South West Coastal</td>
<td>Climate change noted as an issue that may lead to reductions in allocation limits in the future. 1970-1999 rainfall used to calculate allocation limits (p21).</td>
</tr>
<tr>
<td>Rockingham-Stakehill Groundwater Area Water Management Plan (2008)</td>
<td>Rockingham Stakehill</td>
<td>Climate change noted as an issue that may lead to reductions in allocation limits in the future. 1975-2003 used to calculate allocation limits (p46).</td>
</tr>
<tr>
<td>Gnangara Groundwater Areas Allocation Plan (2009)</td>
<td>Gnangara Yanchep Wanneroo Mirrabooka Gwelup Perth Swan Part of Gingin</td>
<td>Climate change noted as an issue that has contributed to decline in groundwater levels and may affect water quality (p15). Allocation limits set on assumption that ‘the drying climate will continue over the coming years’ (p10). The Plan also flagged that the department would ‘develop a framework for determining ecological water requirements in a drying climate’ (p69).</td>
</tr>
<tr>
<td>South West Groundwater Areas Allocation Plan (2009)</td>
<td>Bunbury Busselton–Capel Blackwood SW Coastal</td>
<td>Noted CSIRO modelling predicting that between 1990 and 2030 the South West may experience a 5 to 11% decline in average rainfall based on low (0.54˚C by 2030) and high (1.24˚C by 2030) global warming scenarios (p13). For future allocation scenarios the department calculated recharge using a baseline of 1971-2003 rainfall and reducing recharge by an additional 5 per cent (all aquifers) to represent the decline in rainfall predicted by the CSIRO (pp13-14).</td>
</tr>
<tr>
<td>Upper Collie Water Allocation Plan (2009)</td>
<td>Collie</td>
<td>Climate change noted as an issue in the surface water section of the plan, but not in the groundwater part of the plan. For groundwater, recharge calculated using average rainfall from 1979-1999 (p14).</td>
</tr>
<tr>
<td>Arrowsmith</td>
<td>Arrowsmith</td>
<td>Climate change not mentioned. The plan does not</td>
</tr>
<tr>
<td>Groundwater Allocation Plan (2010)</td>
<td>indicate how mean annual rainfall was calculated (e.g. whether it was based on the recent historical record). (p33).</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Jurien Groundwater Allocation Plan (2010)</td>
<td>Jurien  Climate change not mentioned. The plan does not indicate how mean annual rainfall was calculated. (p33).</td>
<td></td>
</tr>
<tr>
<td>Murray Groundwater Allocation Plan (2012)</td>
<td>Murray  The ‘observed drying climate trend in the South West of Western Australia’ was noted as one of the factors triggering a review of the plan and the 1998 allocation limits (p1). The methods report states that 1975-2009 rainfall was used to calculate recharge. The Plan indicates that the ‘future climate scenario adopted for the South West Coastal groundwater allocation plan (in preparation)’ would be used in annual evaluations (p27).</td>
<td></td>
</tr>
<tr>
<td>Draft Gingin Groundwater Allocation Plan (2013)</td>
<td>Gingin  Assumes a 15 per cent reduction in average annual recharge by 2020 (p22), but does not indicate which years were used to calculate average annual recharge.</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix E

### Over-allocated groundwater resources in the South West (2014)

<table>
<thead>
<tr>
<th>Plan area</th>
<th>Groundwater area</th>
<th>Subarea</th>
<th>Resource</th>
<th>Over-allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockburn</td>
<td>Cockburn</td>
<td>Cockburn Confined</td>
<td>Perth - Leederville.</td>
<td>111.11%</td>
</tr>
<tr>
<td>Cockburn</td>
<td>Cockburn</td>
<td>Cockburn Confined</td>
<td>Perth - Yarragadee North.</td>
<td>100.11%</td>
</tr>
<tr>
<td>Gingin</td>
<td>Gingin</td>
<td>Central Coastal Semi-confined</td>
<td>Perth - Leederville.</td>
<td>161.89%</td>
</tr>
<tr>
<td>Gingin</td>
<td>Gingin</td>
<td>Cowalla Confined</td>
<td>Perth - Leederville - Parmelia.</td>
<td>109.32%</td>
</tr>
<tr>
<td>Gingin</td>
<td>Gingin</td>
<td>Guilderton North</td>
<td>Perth - Superficial Swan</td>
<td>111.39%</td>
</tr>
<tr>
<td>Gingin</td>
<td>Gingin</td>
<td>Red Gully</td>
<td>Perth - Superficial Swan</td>
<td>133.13%</td>
</tr>
<tr>
<td>Gingin</td>
<td>Gingin</td>
<td>SA 3 South</td>
<td>Perth - Leederville.</td>
<td>116.26%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Gnangara</td>
<td>Beermullah Plain South</td>
<td>Perth - Superficial Swan</td>
<td>110.08%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Gnangara</td>
<td>Gnangara Confined</td>
<td>Perth - Yarragadee North.</td>
<td>114.68%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Gwelup</td>
<td>Gwelup Confined</td>
<td>Perth - Leederville.</td>
<td>114.54%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Mirrabooka</td>
<td>Mirrabooka Confined</td>
<td>Perth - Yarragadee North.</td>
<td>126.58%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Mirrabooka</td>
<td>State Forest</td>
<td>Perth - Superficial Swan</td>
<td>103.25%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Perth</td>
<td>City of Nedlands</td>
<td>Perth - Superficial Swan</td>
<td>102.36%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Perth</td>
<td>City of Perth</td>
<td>Perth - Superficial Swan</td>
<td>143.47%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Perth</td>
<td>City of Subiaco</td>
<td>Perth - Superficial Swan</td>
<td>112.92%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Perth</td>
<td>Town of Vincent</td>
<td>Perth - Superficial Swan</td>
<td>143.25%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>Central Swan</td>
<td>Perth - Superficial Swan</td>
<td>143.25%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>East Swan</td>
<td>Perth - Superficial Swan</td>
<td>141.99%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>Neaves</td>
<td>Perth - Superficial Swan</td>
<td>182.74%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>North Swan</td>
<td>Perth - Superficial Swan</td>
<td>149.62%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>Radar</td>
<td>Perth - Superficial Swan</td>
<td>103.14%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>South Swan</td>
<td>Perth - Mirrabooka</td>
<td>100.08%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>South Swan</td>
<td>Perth - Superficial Swan</td>
<td>103.92%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Swan</td>
<td>Swan Confined</td>
<td>Perth - Leederville.</td>
<td>110.06%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Wanneroo</td>
<td>Adams</td>
<td>Perth - Superficial Swan</td>
<td>120.97%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Wanneroo</td>
<td>Carabooda</td>
<td>Perth - Superficial Swan</td>
<td>137.58%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Wanneroo</td>
<td>Lake Gnangara</td>
<td>Perth - Superficial Swan</td>
<td>106.06%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Wanneroo</td>
<td>Mariginiup</td>
<td>Perth - Superficial Swan</td>
<td>116.14%</td>
</tr>
<tr>
<td>Gnangara</td>
<td>Wanneroo</td>
<td>Neerabup</td>
<td>Perth - Superficial Swan</td>
<td>104.50%</td>
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Suitable and unsuitable areas for domestic garden bores in the Perth Metropolitan Region
### Transfer of water entitlements in South West Western Australia, 2007-08 to 2012-13

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### Appendix H

#### Groundwater leases in South West Western Australia, 2007-08 to 2012-13

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