

# ACHIEVING BETTER URBAN WATER MANAGEMENT IN WESTERN AUSTRALIA

Prepared by Shelley Shepherd of Essential Environmental Services for incorporation into the Water Quality improvement Plans for the Swan-Canning and Vasse-Geographe as part of the Coastal Catchments Initiative project: A Framework for implementing water sensitive urban design on the Swan Coastal Plain, with particular regard for the Swan-Canning and Vasse-Geographe catchments.

## 1 INTRODUCTION

There is a critical need to achieve better water management in Western Australia. The current economic climate in Western Australia is driving a significant degree of growth in residential, industrial and commercial development across the State - in Perth and the south-west region, as well as in the north-west. This will put additional pressure on our water resources, in a time when we are already experiencing the declining health of many surface water and estuarine systems, and the impact of climate change and changes in demand and use on our groundwater and other resources is still uncertain. It is therefore crucial to manage and minimise the impact of changes in land use and development on the water cycle.

Consideration of water issues must be integrated with other planning and development issues so that land and water planning are undertaken concurrently, rather than independently and consecutively. This is critical if better urban water outcomes are to be achieved in new development and redevelopment in Western Australia.

Water sensitive urban design has been identified as the most appropriate philosophy for holistic management of urban water resources. Its application is fundamental in reducing the impact of both existing and new urban development. The application of water sensitive urban design aims to achieve the management of flood risk to development, while minimising water use, maximising water reuse, and reducing the water-borne transport of pollutants, particularly nutrients. Using water-sensitive urban design as part of the planning framework also facilitates more timely approvals and reduces bottlenecks at the subdivision and development approvals stages, as it ensures that water is considered as part of decisions on location of land use and the structure or form of estates (structure planning). This aids the resolution of many of the complex water issues associated with land supply.

### 1.1 Moving towards a Water Sensitive City

The National Water Initiative is the national water reform framework for Australia. One of its key elements is that of urban water reform. The National Water Initiative contains commitments to develop innovative ways of achieving more efficient water use in our cities, as well as to support broader health and environmental sustainability needs. The National Water Initiative recognises the importance of integrated urban planning in the development of water sensitive cities (clause 92).

Unfortunately, the National Water Initiative does not define the elements of a water-sensitive city; however, recent research by the National Urban Water Governance Program at Monash University has proposed a set of fundamental principles that would underpin a water sensitive city. These are:

1. intergenerational equity;

2. triple bottom line approach;
3. integrated approach;
4. diverse water sources;
5. city as a catchment;
6. ecosystem services;
7. resilience to climate change and variability;
8. social capital; and
9. a business case.

*Source: Monash University Submission to the Victorian Competition & Efficiency Commission on the Review of the Metropolitan Water Sector, October 2007.*

For further information see [www.urbanwatergovernance.com](http://www.urbanwatergovernance.com).

Moving towards a water sensitive city requires the whole-scale adoption of water sensitive urban design by government, industry and the community.

## **1.2 State Government policy basis**

The State Government has recognised the need for integrated water cycle management and water sensitive urban design to integrate more efficiently land and water planning through policy statements such as:

- State Water Plan (2007);
- State Water Strategy (2003);
- Government Response to the Irrigation Review (2005);
- A Blueprint for Water Reform in Western Australia (2006);
- State Planning Policy No 2 Environment and Natural Resources (2003);
- State Planning Policy No 2.9 Water Resources (2006); and
- Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative (2007).

For further information on these publications, refer to the websites of the Department of Water ([www.water.wa.gov.au](http://www.water.wa.gov.au)) and Western Australian Planning Commission ([www.wapc.wa.gov.au](http://www.wapc.wa.gov.au)).

## **2 WHAT IS WATER SENSITIVE URBAN DESIGN?**

The urban water cycle should be managed as a single system in which all urban water flows are recognised as a potential resource and where the interconnection of water supply, groundwater, stormwater, wastewater, flooding, water quality, wetlands, watercourses, estuaries and coastal waters is recognised (State Planning Policy 2.9 Water Resources, Government of WA, 2006). Water efficiency, re-use and recycling are integral components of total water cycle management (Stormwater Management Manual for Western Australia, DoW, 2004-2007).

The National Water Commission has defined urban integrated water cycle management as:

*“The integration of water supply, sewerage and stormwater, so that water is used optimally within a catchment resource, state and national policy context. It promotes the coordinated planning, development and management of water, land and related resources (including energy use) that are linked to urban areas and the application of water-sensitive urban design principles in the built urban environment.”*

This is depicted in Figure 1 (from the National Water Initiative).

*Figure 1: Managing water resources in an urban development context  
(Source: Adapted from National Water Commission, 2006)*

Achievement of integrated urban water management may be facilitated through the use of water sensitive urban design techniques employed during planning, design and construction of urban developments.

Water sensitive urban design requires the interlinking of the management of urban water streams (potable supply, wastewater and stormwater) with the goals of minimising and treating pollution discharges, reducing potable water use, and efficiently matching different water sources (such as recycled water and stormwater) to fit-for-purpose uses. These aims are met through the urban design process (the planning and architectural design of urban environments) by: the provision of integrated urban water management infrastructure; re-introducing the aesthetic and intrinsic values of waterways into the urban landscape; and promoting new forms of urban design and architecture with the built environment (Institution of Engineers Australia, 2006).

Water sensitive urban design should aim to:

- maintain or restore the pre-development water cycle and natural systems, including catchment and aquifer conditions, ecological values and environmental assets;
- prevent flooding and erosion;
- maintain and/or restore water quality of ground and surface waters;
- achieve sustainable use of water through increased efficiency, reuse and recycling of water on the basis of fit-for-purpose use; and
- incorporate the management of water into the urban landscape in a cost-effective and sustainable manner which supports recreational and cultural values.

These aims can be achieved through appropriate planning and design of urban areas which incorporates various best management practices such as, for example, the implementation

of appropriate structural and non-structural controls for the management of stormwater, together with water-efficient landscaping and an alternative source of water for external use. Additional information is available from the range of sources listed in section 8.

## 2.1 What can water sensitive urban design achieve?

Water-sensitive urban design, by its nature, operates within an urban context. Although its focus is generally in terms of development/redevelopment, the broader implications of its application on the environment should not be ignored. Although often considered only in the context of drainage, it also offers opportunities for conservation of our drinking water as well as for catchment repair and improvements in the environmental health of our water systems.

Although there is limited data regarding the actual performance of water sensitive urban design measures in Western Australia, some design objectives have been adopted in the short term for use in the planning and design process. These design objectives, which were developed by a group of technical experts from around Australia together with local water managers in 2004, provide the most broadly accepted indication of the current performance of water sensitive urban design. The objectives, which are intended to be met in greenfield and retrofit development circumstances, are:

- Water sustainability - Consumption target for water of 100 kL/person/yr, (State water plan target) including not more than 40-60 kL/person/yr scheme water.
- Protection from flooding - Post-development annual discharge volume and peak flows to be maintained relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments.
- Ecological protection - Maintain surface and ground water quality at pre-development levels and, if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located.
- Stormwater quality – water sensitive urban development to achieve a reduction in pollution transported to receiving waterways when compared with conventional urban development. This reduction is in the order of:
  - At least 80 per cent reduction of total suspended solids
  - At least 60 per cent reduction of total phosphorus
  - At least 45 per cent reduction of total nitrogen
  - At least 70 per cent reduction of gross pollutants

It should be noted that in order to meet the objective of 40-60 kL/person/yr scheme water, an alternative water source is required to supply water for external use. These design objectives may be revised as further information on local performance comes to light.

## 3 DEVELOPING THE FRAMEWORK FOR WATER SENSITIVE URBAN DESIGN

In December 2006, the WA State Government gazetted *State Planning Policy 2.: Water Resources*. This policy was made under Section 26 of the *Planning and Development Act 2005* and is the "highest" form of planning policy. *State Planning Policy 2.9 Water Resources* requires land use planning to contribute to the protection and wise management of water resources by ensuring local and regional land use planning strategies, structure plans,

schemes, subdivisions, strata subdivision and development applications take into account total water cycle management and water-sensitive urban design principles. This would ensure that development is consistent with current best management and best planning practices for the sustainable use of water resources.

Development of the policy was the first step in achieving better urban water management outcomes; however, it was recognised that further guidance was required to facilitate its implementation. Additional guidance has now been prepared in the form of a framework that integrates both land use and water planning through application of water sensitive urban design via the planning and approvals system, consistent with *State Planning Policy 2.9 Water Resources* (2006). This framework, entitled *Better Urban Water Management*, provides guidance for planners and decision-makers regarding the consideration of water issues during urban land use planning.

*Better Urban Water Management* outlines the specific actions recommended at each of the key stages of planning to support the planning decision being made. It does not propose an additional layer of approvals but formalises the gathering and consideration of water resource information, ensuring that each land use planning decision is made on the basis of appropriate and necessary information.

*Better Urban Water Management* was developed by the Department for Planning and Infrastructure in partnership with the Department of Water, the Western Australian Local Government Association and the Federal Department of the Environment, Water, Heritage and the Arts as part of the Coastal Catchments Initiative for the Swan-Canning and Vasse-Geographe systems. It was developed by a stakeholder reference group and has the support of all members of that group, including state and local government and peak bodies.

*Better Urban Water Management* is a refinement of the approach which has been applied in the Southern River/ Forrestdale/ Brookdale/ Wungong District Structure Plan area, which is recognised as a demonstration project for water-sensitive urban design. The approach is also consistent with the model *Water Sensitive Urban Design Local Planning Policy* developed for the Peel-Harvey Coastal Catchment by the Peel Development Commission and referred to in the draft *Water Quality Improvement Plan for the Rivers and Estuary of the Peel Harvey System* (EPA, 2007).

Linkages between existing planning policy and guidelines are explained in Planning Bulletin 92. The Bulletin ensures currency with the requirements of Liveable Neighbourhoods (2007) and notes the importance of meeting the requirements of *Better Urban Water Management*.

#### **4 SUPPORTING THE IMPLEMENTATION OF BETTER URBAN WATER MANAGEMENT**

Experience gained from the water sensitive urban design demonstration projects in the Southern River and Peel-Harvey catchments suggested that the key areas required for successful implementation of water sensitive urban design are:

- clear governance structures with defined and well-known roles, responsibilities and accountabilities;
- integration of water planning with the land use planning system in a manner which does not complicate the existing approvals system;
- information on hydrological conditions to support planning for development in areas under development pressure;

- guidelines which clearly identify requirements for information to support decision making and tools which aid and standardise the assessment of supporting information;
- capacity building of government and industry in the process and practice of water sensitive urban design, including effective transfer of information and development of professional networks; and
- a coordinated research and development program to gather information on the performance, cost and maintenance requirements of best management practices.

Some of the above elements have been addressed by the Swan-Canning and Vasse-Geographe Coastal Catchments Initiative project. The primary objective of developing *Better Urban Water Management* was to provide a framework for the integration of water into the planning system. A secondary outcome was the clarification of governance requirements and structures.

Two other sub-projects of the Coastal Catchments Initiative for the Swan-Canning and Vasse-Geographe systems are the development of modelling and assessment tools for the management of water quality and quantity from urban development, and capacity-building for Government and industry in water sensitive urban design.

#### **4.1 New WAtEr Ways**

A capacity-building program known as New WAtEr Ways has been established to build a greater level of understanding and support for water sensitive urban design. The program partners are the Department of Water, Department for Planning and Infrastructure, Water Corporation, Urban Development Institute of Australia (WA), Perth Region NRM and the Western Australian Local Government Association.

New WAtEr Ways is aimed at building the capacity of Government and industry practitioners by delivering an adaptive and responsive up-skilling program for State and Local Government engineers, planners and the development industry in water-sensitive urban design. The program has strong linkages to local government and industry which enhances the water sensitive urban design knowledge base and facilitates on-ground outcomes. It proposes to incorporate learnings from innovative, urban water sensitive projects to share amongst the network through a series of interactive training events, awareness building and support.

For further information, see [www.newwaterways.org.au](http://www.newwaterways.org.au).

#### **4.2 Guidelines for the use of MUSIC on the Swan Coastal Plain**

In order to address the lack of modelling and assessment tools for water quality management in Western Australia, a tool known as MUSIC, developed in the eastern states, has been calibrated for various catchments in developing areas in the Shire of Busselton and the City of Swan.

Some concerns have been raised about the use of MUSIC on the Swan Coastal Plain, due to both the strong influence groundwater has on stream flow in many areas and the different catchment conditions as compared to the eastern states. Some guidelines have been produced to demonstrate how MUSIC can be modified to enable SymHyd, the underlying hydrological model within MUSIC, to model hydrological conditions on the Swan Coastal Plain, as well as provide some parameters which should be modified within MUSIC to be more reflective of catchment conditions on the Swan Coastal Plain.

### 4.3 Addressing the remaining needs

External to the Swan-Canning and Vasse-Geographe Coastal Catchments Initiative project, the Department of Water's Urban Drainage Initiative is addressing some of the other key needs for the delivery of water sensitive urban design. The Department of Water is producing drainage and water management plans which provide advice and information to aid the achievement of water sensitive urban design in areas under immediate pressure for urban development.

Additional detailed guidance has been developed on the requirements of particular water management strategies and plans outlined in *Better Urban Water Management*. This guidance is contained in the DoW's guidelines for developing a local water management strategy (DoW, in publication) and *Urban water management plans: guidelines for preparing plans and complying with subdivision conditions* (DoW, 2008).

The Department of Water is also scoping the research and development needs and support development of a coordinated program in the near future.

For further information on the Department of Water's activities, visit [www.water.wa.gov.au](http://www.water.wa.gov.au).

## 5 ADVANCING ACHIEVEMENT OF WATER SENSITIVE URBAN DESIGN

Significant advances have been made in the achievement of water sensitive urban design on the Swan Coastal Plain over the last few years. This has been primarily in greenfield development in the Swan-Canning and Peel-Harvey catchments. Many of these advances have been greatly influenced by the many champions of water sensitive urban design in Western Australia. Further work is required, however, to truly institutionalise the integration of water resources into the planning and development system in WA.

Although the Department of Water has the mandate to achieve improved management of our water resources, the management of groundwater, surface water, wastewater and potable water to enhance catchment health within an urban context is not something that a single agency either is responsible for or can achieve by itself. This actually requires a shared understanding of the principles of water-sensitive urban design by all stakeholders, including service providers, which is translated into a well-defined and common goal.

The presence of water sensitive urban design policy does not ensure its implementation. Even producing guidelines is not enough to guarantee outcomes. Stakeholders are more likely to support a new approach if they can see how it is translated into on-ground outcomes. This is likely to require more multi-agency demonstration projects to produce information on performance and cost of management practices, as well as user-friendly and reliable assessment tools and the building of capacity within the land use and water planning fraternities. The building of capacity must also provide recognition and support for the water sensitive urban design champions, who play such an important role.

Cooperation and integration within and between agencies is vital to make water sensitive urban design work. Formal and informal linkages need to be established and understood within the context of the agreed roles and responsibilities. Effective communication and integration will require an improved level of understanding of the roles and activities of each organisation involved.

There is a need to develop accepted design objectives and targets which are linked to a statutory implementation mechanism and supported by trusted and reliable, peer-reviewed science. This will ensure that all development is responsible for its performance in terms of water use, quality and quantity outcomes. Furthermore, some state-level policy guidance is required on how development should address pre-development elevated levels of nutrients in groundwater, as well as the use of wetlands as part of an integrated stormwater management system.

Research and development is also essential to demonstrate the effectiveness of water sensitive urban design on the ground in Western Australia. This requires accurate monitoring of performance to validate its approaches and also to feed back into the calibration of assessment tools. This program should also investigate the tools and options available for the standardisation of the assessment of water management documentation. Any development of tools would need to be supported by all stakeholders with well-documented assumptions.

There is also a need to foster greater innovation and uptake, particularly in the areas of water re-use and recycling. This will require significant State Government leadership as well as a high level of consultation to address multi-stakeholder issues, particularly that of the Department of Health, as well as the perception and education of the community.

## **6 CONCLUSION**

The impact of climate change requires improved management of our urban water resources so that development is able to achieve multiple objectives relating to the management of flooding, minimised use of drinking water, maximised fit-for-purpose use of water, and ensure better water quality management, consistent with *State Planning Policy 2.9 Water Resources*.

It is vital that water sensitive urban design is supported by all stakeholders through incorporation into existing systems and processes, so that it becomes an integral part of their role and function. This will be facilitated by *State Planning Policy 2.9 Water Resources* via the requirements outlined in *Better Urban Water Management*, which was developed as part of the Swan-Canning and Vasse-Geographe Coastal Catchments Initiative.

Some achievements have been made, particularly in greenfield developments; however, these need to be more widely disseminated and learnings transferred to future projects. A climate of continual advancement is necessary if water sensitive urban design is to become an entrenched philosophy, leading to the creating of a water sensitive city.

## **7 ACKNOWLEDGEMENTS**

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Further information is available from the Department for Planning and Infrastructure or at [www.water.wa.gov.au](http://www.water.wa.gov.au), [www.newwaterways.org.au](http://www.newwaterways.org.au) and [www.swanrivertrust.wa.gov.au](http://www.swanrivertrust.wa.gov.au).

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