



Guidance note 7

Managing the hydrology and hydrogeology of water dependent ecosystems in urban development

This note is one in a series that aims to assist people and organisations involved in implementing *Better urban water management* (BUWM), which was developed by the Western Australian Planning Commission in 2008. It outlines a process that proponents applying for a change of land use can use to assess and make recommendations for managing the hydrology and hydrogeology of water dependent ecosystems (WDE) to make sure that their ecological health is maintained.

'Hydrology' is the study of water, its properties, movement, distribution and utilisation above, on and below the earth's surface.

'Hydrogeology' is the hydrological and geological science concerned with the occurrence, distribution, quality and movement of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.

Background

WDE are valuable state assets and it is expected that their physical condition and ecological health will be maintained or improved during land development.

The Department of Water, the Department of Environment and Conservation (DEC) and the Swan River Trust are responsible for protecting water dependent ecosystems by maintaining the hydrology and hydrogeology that sustains their biological and physical features and processes and hence their ecological, economic, social and cultural values.

Water dependent ecosystems are parts of the environment in which the composition of species and natural ecological processes are determined by the permanent or temporary presence of flowing or standing surface water or groundwater. The in-stream areas of rivers, riparian vegetation, springs, wetlands, floodplains, estuaries, karst systems and groundwater-dependent terrestrial vegetation are all WDEs. These ecosystems can also be defined in terms of particular highly valued species, ecological assets or ecosystem functions (National Water Commission 2012). Changing land use may alter the hydrology and/or the hydrogeology that supports a WDE. These potential changes need to be considered, and appropriate management methods proposed by the proponent, early in the planning process.

Considering water dependent ecosystems during the land planning process

A basic principle of *Better urban water management* (Western Australian Planning Commission 2008) is that land-use planning decisions should be based on an appropriate level of information. Figure 1 shows the information required for managing the hydrology

and/or hydrogeology of WDEs. It shows a four-step process that is consistent with the approach used in *Better urban water management*.

The water dependent ecosystem will be considered to be protected and appropriately managed if either:

- the pre-development hydrological and/or hydrogeological conditions of the water dependent ecosystems will be maintained or improved (see Step 3)

or, if the hydrological and/or hydrogeological conditions will be changed then:

- further investigations must demonstrate that the change in hydrological and/or hydrogeological conditions will not result in unacceptable adverse effects on the water dependent ecosystem (see Step 4).

The process for determining when the above criteria have been met is outlined in the following sections, which provide more detailed descriptions of each step.

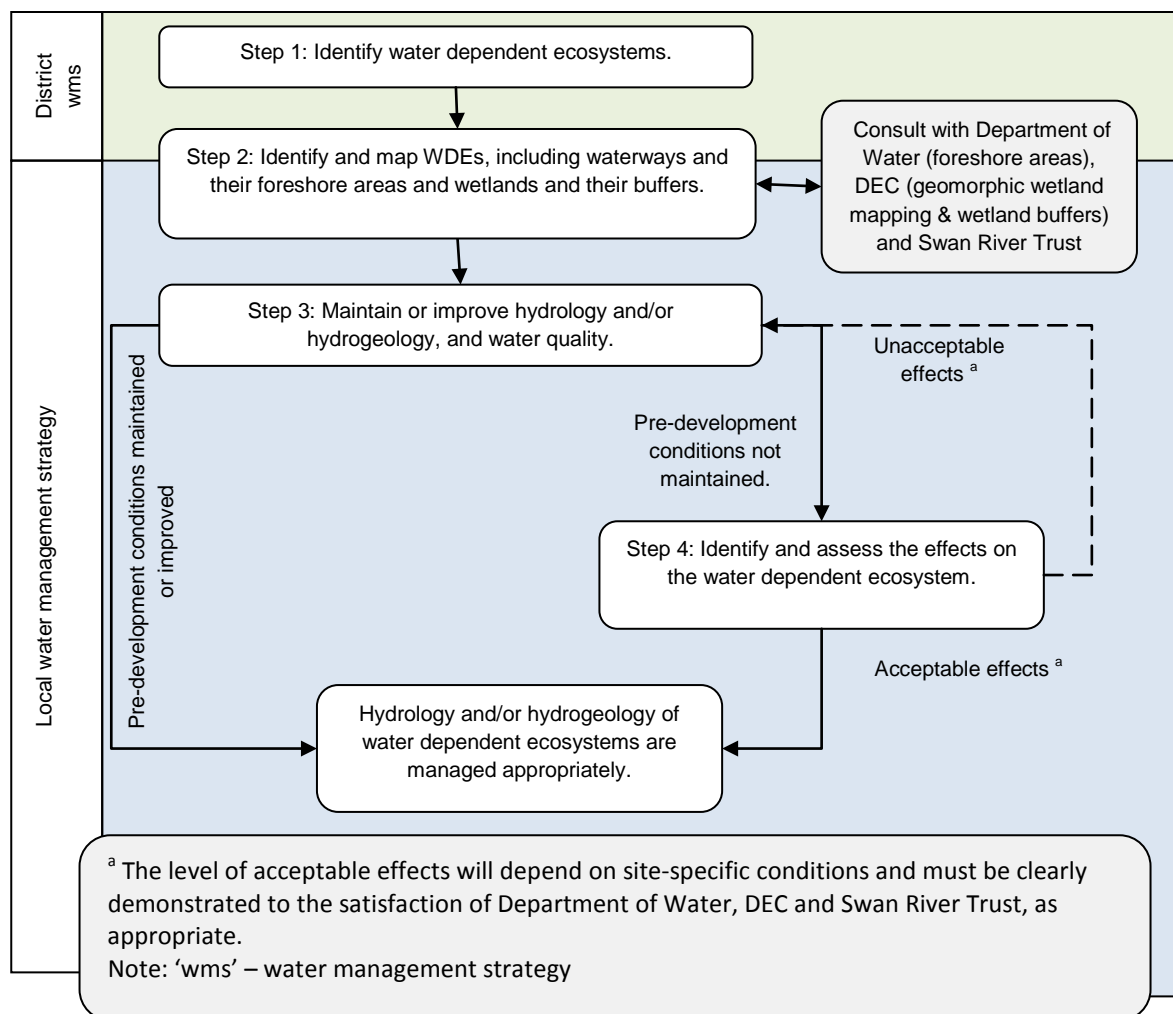


Figure 1 Process for managing the hydrology and/or hydrogeology of water dependent ecosystems in urban development

Step 1: Identify water dependent ecosystems

- Identify all water dependent ecosystems that may be affected by a change in hydrology and/or hydrogeology due to the proposed development.

- WDEs should be mapped within and adjacent to the development area. The WDEs are described in *Guidance statement 33 – Environmental guidance for planning and development* (Environmental Protection Authority 2008), in particular chapters B1 to B6, B8 and B9.
- Any WDEs identified in a regional water management strategy should be included in Step 1. Proponents should check with the Department of Water to ensure the information provided in these documents is current and relevant.
- Geomorphic wetland mapping is available for the Swan Coastal Plain and other select areas of WA at : <http://www.dec.wa.gov.au/management-and-protection/wetlands/wetlands-mapping.html>

Step 2: Identify and map water dependent ecosystems, including waterways and their foreshore areas and wetlands and their buffers

The extent of waterways and their foreshore areas and/or wetlands and their buffers need to be identified.

The methods to be used when identifying and delineating waterway foreshore areas and wetland buffers is described in the documents below.

Relevant to waterways and their foreshore areas (refer to Department of Water)

- *Operational policy: Identifying and establishing waterways foreshore areas* (Department of Water 2012)

This policy describes how, at the regional and district level of land planning, indicative foreshore area boundaries need to be defined by the proponent so that more detailed investigation and planning can be carried out at later stages of the planning process. Exact foreshore area boundaries are identified at the local planning level, unless there is a high risk (such as potentially polluting land uses), significant site constraints or unless detailed district structure planning is being undertaken. In these circumstances either refinement or finalisation may be expected at the district planning level.

- *Determining foreshore reserves* (Water and Rivers Commission 2001a)

Further guidance on how to identify a foreshore area will be provided in the *Guidelines for identifying and establishing waterways foreshore areas* (Department of Water in preparation). Until these guidelines are finalised, the existing guideline *Determining foreshore reserves* should be used. The proponent should advise the regional office of the Department of Water and the relevant local government authorities about the proposed foreshore area. Preliminary advice about waterways should be sought early in the planning process.

Wetlands and their buffer areas (refer to Department of Environment and Conservation)

- *Position statement: Wetlands* (Water and Rivers Commission 2001b) (note: this refers only to wetlands on the Swan Coastal Plain).
- *Guidelines checklist for preparing a wetland management plan* (Department of Environment and Conservation 2008).

The waterway foreshore areas should be discussed with the Department of Water and the wetland buffers with the Department of Environment and Conservation.

- *Guideline for the determination of wetland buffer requirements* (Western Australian Planning Commission 2005).
- For further information on wetlands and their buffer areas also see:
 - <http://www.dec.wa.gov.au/management-and-protection/wetlands/wetland-management-in-wa.html>
 - *Guidance statement 33 – Environmental guidance for planning and development*, in particular chapter B4.3 (Environmental Protection Authority 2008).

Step 3: Maintain or improve the hydrology and/or hydrogeology and water quality

To appropriately manage a proposed development so that there is a low risk to the hydrology and/or hydrogeology that supports a water dependent ecosystem, the following requirements must be met.

Stormwater

Stormwater should be managed in accordance with the *Decision process for stormwater management in WA* (Department of Water 2009) and *Stormwater management manual for Western Australia* (Department of Water 2004–2007). This includes maintaining or improving the pre-development conditions. Factors to be considered include:

- peak flows
- seasonality of flows
- discharge pathways
- water quality in receiving WDEs
- annual frequency
- level and duration of inundation.

Proponents should not design new stormwater and/or groundwater drainage infrastructure within foreshore areas and/or wetland buffers, unless benefits to the water dependent ecosystem can be clearly demonstrated to the satisfaction of the Department of Water, the Department of Environment and Conservation and the Swan River Trust, as appropriate.

Groundwater

Any proposed controlled groundwater level should be investigated and defined as outlined in the *Decision process for stormwater management in WA* (Department of Water 2009) and *Water resource considerations when controlling groundwater levels in urban development* (Department of Water in preparation). When setting the control groundwater level (CGL) the groundwater regime should not be altered, by greater than normal climatic variances, within the approved waterway foreshore area or wetland buffer (as defined in Step 2).

If altering the groundwater regime by more than normal climatic variances, it must be demonstrated to the satisfaction of the responsible agency (e.g. Department of Environment and Conservation, Department of Water and/or Swan River Trust) that the WDE is not detrimentally impacted. This may require an assessment of the wetlands monthly catchment water balances, taking into account:

- the pre-development and post-development total water balance of the WDE including surface water, groundwater and climatic (direct rainfall and evapotranspiration) inputs and outputs
- changes resulting from proposed surface water management system
- changes resulting from proposed groundwater management system, considering:
 - depth of the CGL relative to the pre-development groundwater regime
 - horizontal distance between the CGL and WDE and the WDE's protection zone
 - groundwater aquifer characteristics.

Better urban water management shows that design objectives are usually set to ensure the hydrology and/or hydrogeology is maintained and the pre-development surface water and groundwater quality is maintained or improved. The proponent should provide design criteria and proof of concept designs, for the urban structure and how these address water use and management, at the local level of land planning. If there are high risks there may be a request by the various agencies. (e.g. Office of the Environment Protection Authority, Department of Water, Department of Environment and Conservation and Swan River Trust), that these investigations and analysis be carried out at the district level of land planning.

If the proposed design criteria are in accordance with the requirements given in Step 3 there is no need for Step 4 to be completed.

Step 4: Identify and assess the effects on water dependent ecosystems

If the design criteria do not meet the requirements given in Step 3, then Step 4 requires an appropriate level of investigation to show that the design criteria will not cause unacceptable effects on the water dependent ecosystem. The level of acceptable effects will depend on site-specific conditions and will require consultation with the Department of Water, the Department of Environment and Conservation and the Swan River Trust, as appropriate. The Department of Water will consider the level of effects on our targets and priorities, such as water allocation plans and Ministerial criteria. It should be noted that further investigations may require significant time and money to complete and may include the need to determine detailed ecological water requirements.

For further information for identifying and assessing possible effects on water dependent ecosystems, refer to Statewide policy no. 5 - *Environmental water provisions policy for Western Australia* (Waters and Rivers Commission 2000).

If, based on the evidence provided, the Department of Water, the Department of Environment and Conservation or the Swan River Trust, as appropriate, considers that the chosen design will not have unacceptable effects on the WDE then it will be considered to be managed appropriately.

If the chosen design seems likely to have unacceptable effects on the WDE, the proponent will be requested to return to Step 3 and modify their design.

If the environmental effects are likely to be significant then the development proposal may be referred to the Environmental Protection Authority for consideration.

References

- Department of Environment and Conservation 2008, *Guidelines checklist for preparing a wetland management plan*, Department of Environment and Conservation, Perth.
- Department of Water 2004–2007, *Stormwater management manual for Western Australia*, Department of Water, Perth.
- 2009, *Decision process for stormwater management in WA*, Department of Water, Perth.
- 2012, *Operational policy: Identifying and establishing waterways foreshore areas*, Department of Water, Perth.
- in preparation, *Guidelines for identifying and establishing waterways foreshore areas*, Department of Water, Perth.
- in preparation, *Water resource considerations when controlling groundwater levels in urban development*, Department of Water, Perth.
- Environmental Protection Authority 2008, *Guidance statement 33 – Environmental guidance for planning and development*, Environmental Protection Authority, Perth.
- National Water Commission 2012, *Australian environmental water management: framework criteria*, National Water Commission, Canberra.
- Water and Rivers Commission 2000, Statewide policy no. 5 – *Environmental water provisions policy for Western Australia*, Department of Water, Perth.
- 2001a, *Determining foreshore reserves*, River restoration report no. RR16, Water and Rivers Commission, Perth.
- 2001b, *Position statement: Wetlands*, Water and Rivers Commission, Perth.
- 2002, *Foreshore policy 1 – Identifying the foreshore area*, Department of Water, Perth.
- Western Australian Planning Commission 2005, *Guideline for the determination of wetland buffer requirements*, Western Australian Planning Commission, Perth.
- 2008, *Better urban water management*, Western Australian Planning Commission, Perth.

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