GOVERNMENT OF WESTERN AUSTRALIA

WAPC Western Australian Planning Commission

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Planning for Water Guidelines

For the implementation of State Planning Policy 2.9 Water

December 2025

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Acknowledgments

The Department of Planning, Lands and Heritage acknowledges the traditional owners and custodians of this land. We pay our respect to Elders past and present, their descendants who are with us today, and those who will follow in their footsteps. DPLH gratefully acknowledges the support and assistance of consultants Urbaqua Land and Urban Water Solutions in the development of this document.

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SPP 2.9 and this Guideline, in accordance with Part 3, of the Planning and Development (State Planning Policies) Regulations 2024, repeals the following State Planning Policies:

1. *State Planning Policy 2.1 Peel-Harvey Coastal Plain Catchment*
2. *State Planning Policy 2.2 Gnangara Groundwater Protection*
3. *State Planning Policy 2.3 Jandakot Groundwater Protection*
4. *State Planning Policy 2.7 Public Drinking Water Source Policy*
5. *State Planning Policy 2.9 Water Resources*
6. *State Planning Policy 2.10 Swan-Canning River System*
7. *Draft State Planning Policy 2.9 Planning for Water*

SPP 2.9 and this Guideline replaces the following policies and guidelines:

1. *Better Urban Water Management*
2. *Government Sewerage Policy*
3. *Government Sewerage Policy Explanatory Guidelines*..

Where there are inconsistencies between SPP 2.9 and the flood measures in Section 5.2 of the *State Planning Policy 3.4 Natural Hazards and Disasters*, SPP 2.9 prevails.

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TABLES

1 INTRODUCTION

The Guidelines should be read in conjunction with the *State Planning Policy 2.9 Water* (SPP 2.9).

1.1 Purpose of these Guidelines

The Guidelines provide support for decision-making authorities, planners, landowners/proponents and referral agencies to implement SPP 2.9. Specifically, they assist in:

i. determining appropriate land use planning practices in relation to water resources across Western Australia;

ii. specifying the requirements to be met at each stage of the planning process; and

iii. ensuring necessary water resource management measures are incorporated into land development.

1.2 How to use the Guidelines

The Guidelines provide guidance on satisfying the requirements of SPP 2.9 policy measures. Specifically, the information provided seeks to inform the planning and development approvals processes, including key concepts, considerations for proposals as well as supporting information and resources.

In accordance with measure 7.1(b) of SPP 2.9, a Water Management Report (WMR) is required in most, but not all, instances to demonstrate the appropriate protection, management and use of water resources. The type of WMR to accompany proposals should correspond to the relevant planning decision. Appendices B, C, D and E provide guidance on the preparation and contents of a WMR and how water resources should be considered at each stage of the planning process. This is achieved by identifying the various actions and investigations required to support the planning decision being made.

1.3 Supporting documents

Implementation of SPP 2.9 is supported by several documents, policies and guidelines produced by other Western Australian State Government agencies with a responsibility for water resource management.

Key documents include, but are not limited to:

i. *Decision Process for Stormwater Management in Western Australia* (Department of Water and Environment Regulation (DWER), 2017).

ii. *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022).

iii. *Environmental Factor Guideline - Inland Waters* (Environmental Protection Authority of Western Australia (EPA), 2018).

iv. *Water Resource Considerations When Controlling Groundwater Levels in Urban Development* (DoW, 2013).

v. *Draft Specification Separation Distances for Groundwater Controlled Urban Development* (Institute of Public Works Engineering Australasia (IPWEA), 2016).

vi. *Water Quality Protection Note 25 (WQPN25): Land use compatibility tables for public drinking water source areas* (DWER) and other water quality protection notes prepared by DWER.

vii. *Guideline for the Approval of Non-Drinking Water Systems in Western Australia* (DoW, 2013).

viii. *Public Parkland Planning and Design Guide WA* (Government of Western Australia, 2014).

ix. *Swan Canning River Protection Strategy* (Department of Biodiversity, Conservation and Attractions (DBCA), 2015).

x. *Corporate Policy Statement No. 42: Planning for Land Use, Development and Permitting Affecting the Swan Canning Development Control Area* (DBCA, 2016) and other Swan Canning planning and development policies, guidelines, plans, and procedures prepared by DBCA.

xi. *Operational Policy: Identifying and Establishing Waterway Foreshore Areas* (DoW, 2012).

xii. *Stocking Rate Guidelines for Rural Small Holdings, Swan Coastal Plain and Darling Scarp and Surrounds, Western Australia* (Agriculture WA (Van Gool, D; Angell, K; and Strange, L), 2000).

xiii. *Water monitoring guidelines for better urban water management strategies and plans* (DoW, 2012).

xiv. DWER regional water plans, water quality improvement plans, water supply plans and strategies, water allocation plans, drinking water source protection reports, drainage and water management plans, river action and recovery plans and floodplain mapping.

xv. *National Water Quality Management Strategy (NWQMS) - Australian Drinking Water Guidelines* (National Health and Medical Research Council, 2011, updated 2018).

xvi. *Local Government Guidelines for Subdivisional Development* (IPWEA, 2017).

xvii. *Best Practice Erosion and Sediment Control* (International Erosion Control Association Australasia, 2008).

xviii. *Australian Standard AS/NZS 1547 On-Site Domestic Wastewater Management* (Standards Australia/New Zealand Standard, 2012).

xix. *Environmental Guidance for Planning and Development – Guidance Statement 33* (EPA, 2008).

xx. *A Guide to Managing and Restoring Wetlands in Western Australia* (the former Department of Environment and Conservation, 2012).

xxi. *Australian Disaster Resilience Guideline 7-3 Flood Hazard* (The Australian Institute for Disaster Resilience, 2017).

xxii. *Guidelines for the Non-potable Uses of Recycled Water in Western Australia* (Department of Health (DoH), 2011).

xxiii. *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks - Phase 2* (National Health and Medical Research Council, 2008).

xxiv. *Guidance on Site and Soil Evaluation for Onsite Sewage Management* (DoH, 2020).

xxv. *Template for Site and Soil Evaluation Report* (DoH, 2020).

xxvi. *Guidelines for Mosquito Management: Planning Requirements for Developments in Proximity to Wetlands* (DoH, 2021).

xxvii. *NWQMS - Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Stormwater Harvesting and Reuse.*

xxviii. *NWQMS - Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1).*

1.3.1 Mapping and data

SPP 2.9 and Guidelines are supported by interactive maps available online at www.dplh.wa.gov.au. This mapping identifies areas where geographical specific provisions of SPP 2.9 apply, including:

i. Public drinking water source areas (PDWSAs), priority areas and protection zones;

ii. Peel-Harvey coastal plain catchment;

iii. Swan Canning river system and Swan Canning Development Control Area; and

iv. sensitive water resource areas.

Other useful sources of geographic data include:

v. DataWA's Shared Land Information Platform (SLIP) via www.data.wa.gov.au;

vi. Local Government IntraMaps (on individual websites);

vii. Australian Government's National Map;

viii. Department of Primary Industries and Regional Development's (DPIRD) natural resource information (NRInfo) mapping;

ix. DWER mapping tools, including floodplain mapping and Perth groundwater map;

x. clearing controlled land under the *Country Areas Waters Supply Act 1947*;

xi. waterways management areas under the *Waterways Conservation Act 1976*;

xii. proclaimed groundwater areas, surface water areas, rivers and irrigation districts under the *Rights in Water and Irrigation Act 1914*; and

xiii. Aboriginal Cultural Heritage Inquiry System (ACHIS)

1.4 Integrated water resource management

Integrated water resource management is defined as:

> *A process which promotes the co-ordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (Global Water Partnership, 2000).*

It includes the management of all water resources including sustainable drinking and non-drinking water supplies; stormwater, groundwater and wastewater management; flood and inundation risk management; and protection of water quality and water-dependent ecosystems. Integrated water management should be applied in planning and development decision-making to ensure that the public health, environmental, social, cultural and economic values of water resources are recognised and maintained. To achieve this, all water-related matters across the planning framework are consolidated and included in the requirements of SPP 2.9.

Water Sensitive Design (WSD) helps to deliver integrated water resource management. Historically referred to as Water Sensitive Urban Design, WSD is a planning and engineering approach that incorporates elements of the water cycle into the design of towns and cities.

Its relevance extends beyond urban zoned land and has evolved to apply to a wide range of zones and land uses, including industrial, recreation, tourist and rural residential. WSD outcomes also support the vision of water sensitive or waterwise places that are cool, liveable, green and sustainable, places where people want to live, work and spend their time.

Some of the key principles that support WSD, which are to be incorporated into development where appropriate, are to:

i. provide protection from flooding (one in 100 (one per cent) annual exceedance probability (AEP) flood event);

ii. maximise water use efficiency and facilitate fit-for-purpose water sources including water reuse;

iii. manage rainfall/stormwater as close to the source as possible, and maintain the pre-development hydrological regime;

iv. mimic and enhance natural systems;

v. retain, restore and protect wetlands and waterways;

vi. prevent and reduce mobilisation of pollutants and protect water quality in receiving environments;

vii. create fit-for purpose, safe and sustainable water management systems; and

viii. ensure economic, social and cultural values of water resources are recognised and maintained.

2 GUIDING PRINCIPLES

The following principles provide the contextual framework for the implementation of SPP 2.9. They should be used to guide the proponent in the preparation of a WMR and for the decision-maker to acknowledge when considering water matters and making decisions in relation to planning and development.

1. Outcome-focused decision-making

Discretion in planning and development decision-making should focus on achieving the policy outcomes of SPP2.9.

2. Early consideration

Water resources are identified and addressed from as early as possible in the planning process and at all subsequent stages. Water resource considerations should not be deferred if they are likely to pose significant issues that will become more difficult to resolve at subsequent planning stages.

3. Site-responsive solutions

Investigations and consideration of water resources should respond to only those identified issues relevant to the site, the potential impacts of activities undertaken on the site and impacts from or to the surrounding water matters. Proposed water management measures should be tailored to local and site-specific attributes.

4. Risk management

The nature and scale of the required information, investigation or response provided should be commensurate with the significance of the water matter and the level of risk the proposal could create or be exposed to.

5. Evidence-based decision-making

Planning decisions are supported by reliable, current and accurate evidence and science to objectively assess water resource matters. Where preliminary investigations suggest an enhanced level of risk to the environment, community, water resource or proposal is evident, more detailed investigations may be required.

6. Collaboration

The preparation and assessment of WMRs should draw on all relevant disciplines through an integrated and collaborative approach to ensure all stakeholder interests and objectives are understood and considered.

Early engagement with State and local government, assessing authorities, regulators, service providers, industry bodies and the community (where appropriate) is encouraged.

7. Precautionary principle

The presumption against approving further strategic planning proposals, subdivision and development applications or intensification of land uses where there is a lack of certainty that the potential for significant adverse impacts can be adequately avoided, mitigated or managed in the opinion of the decision-maker.

8. Intergenerational equity

Planning and development decisions should consider the needs of future generations.

3 CONSIDERING WATER RELATED IMPACTS OF CLIMATE CHANGE

SPP 2.9 encourages proposals to adapt to the predicted impacts of climate change in relation to water resources. Managing the impacts of climate change is essential for the sustainable management of our state's water resources. Climate change impacts should be addressed in the consideration of water resource matters and, where applicable, reflected in the WMR.

Timely consideration of climate change impacts on infrastructure will help produce more resilient and adaptable infrastructure that will ultimately reduce future costs. For example, it may reduce the need for expensive retro-fits to infrastructure or the construction of new infrastructure to respond to climate change impacts.

Changes to Western Australia's climate, including rainfall, temperature, evaporation and extreme weather events, influence the availability and quality of water resources as described below:

1. Reduced rainfall across the South-West land division has:
    a. reduced groundwater and surface water availability for non-drinking water supplies to irrigate green spaces;
    b. increased the need for climate-independent drinking water supplies;
    c. increased the need to fully consider water conservation and supplementary water supplies for all water uses;
    d. impacted on water quality due to changing quantity and quality of inflows or exposure of acid sulfate soils due to changing groundwater levels;
    e. impacted on water-dependent fauna, flora and ecosystems, for example, increasing the importance of dry season refuges for aquatic fauna and/or changing their location; and
    f. increased the need to consider the migration or passage of aquatic fauna.
2. Increased frequency of heatwaves and associated temperatures resulting in:
    a. increased demand for water, for both household use and public open space irrigation; and
    b. a reduction of water availability from surface water and groundwater supplies.
3. Increased sea levels, which may increase estuarine and riverine flood levels, groundwater levels and the potential for saltwater intrusion into groundwater and surface water resources.
4. Changes in the frequency and magnitude of extreme weather events may:
    a. alter the frequency and extent of flooding and droughts; and
    b. mobilise greater volumes of sediment, which may negatively impact on water quality.
5. Increased water temperature, which lowers oxygen levels and increases the risk of algal blooms and fish kills;
6. Increased bushfire risk, frequency and intensity, which threaten the extent and condition of native vegetation and aquatic ecosystems important for protection of water resources.
7. Increased salinisation of land and water resources in the South-West, which has negative impacts on land, water, biodiversity and infrastructure and should be considered in planning decision-making.

4 ADDRESSING CUMULATIVE IMPACT

Cumulative impacts are the interactions or compounding effects of one or more impacts, including past, present and (reasonably) foreseeable future pressures. Planning decisions should consider the cumulative impacts of development and land uses that may cause significant and/or detrimental impacts on water resources.

The consideration of cumulative impacts takes into account the compounding effects of direct, indirect and consequential impacts over time. In many instances, individual subdivision or development proposals will not have a significant impact on water resources if appropriately managed. However, over time and where further intensification of development or a proliferation of similar proposals in the surrounding area occurs, the cumulative impact may significantly affect the water quality, quantity, physical condition and ecological health of water resources. The consideration of cumulative impacts will vary depending on the water resource issue relevant to the site and the type and scale of proposed development. No single approach to cumulative impacts can satisfy the often-unique circumstances surrounding a particular area or proposal.

Cumulative impact consideration has many benefits to the environment and the community. Within the land planning and development context, it is a necessary consideration to ensure all proposed development within a particular area can occur because the cumulative impact of doing so has been factored into the decision.

It can assist in avoiding the scenario where most of the permitted development occurs but the remaining proposals may become more constrained and difficult to deliver because the cumulative impact of the previous development now represents a significant constraint (for example, drainage or flooding).

Cumulative impacts should particularly be considered at the regional and district levels of planning (such as the preparation and amendment to strategies and schemes). It is a complex and difficult task to determine the extent and analysis of cumulative impacts and therefore identifying and understanding cumulative impacts is a shared responsibility, requiring consultation with other stakeholders, particularly DWER. Consideration of cumulative impacts will only be required at subdivision if not already considered through zoning or structure planning. Cumulative impacts should not be considered a reason for refusal at the development approval stage.

Cumulative impact consideration will not be relevant for all planning and development decisions and should be undertaken only where there is the likelihood of significant impacts from more than one proposal. Considerations should be 'fit for purpose' and adapted to the site-specific circumstances faced. In most circumstances, it will likely be a qualitative assessment of any potential cumulative impacts. In more limited circumstances, the potential cumulative impacts may require more technical information to support a decision. The relevant information should be included within the WMR as part of the planning and water resource context.

The decision-maker, on advice from other stakeholders, is responsible for the consideration of cumulative impacts. Proponents are responsible for the submission of sufficient information as outlined in Section 5 Water Management Reports.

In planning decisions, the decision-maker considers cumulative impacts at a strategic level as a four-stage process:

i. Determine the spatial area for which the impact could occur, inclusive of areas that may in the future be considered for intensification or a change in land use. Depending on the nature of the affected water resource(s), the area will vary.

ii. Determine the potential extent of development that may result in a cumulative impact, inclusive of areas that may in the future be intensified. This will be based on the lot sizes, zoning and any other relevant planning instruments.

iii. Evaluate the overall impact of such development. In most instances the evaluation will be qualitative.

iv. Decide on appropriate actions. For example, if the cumulative impact is considered significant, it may not be appropriate to support the proposal. This may involve refusing the strategic proposal or amending the proposal to reduce the cumulative impact (e.g. smaller land area rezoned).

For example:

1. A proposal to rezone to Urban an area of rural land, which has a major rural drain traversing the site that serves a broader catchment area. If insufficient land is set aside to allow for future upgrades to the rural drain, there is the potential for the rezoning and ultimate development of the area to constrain land use planning in the broader catchment area. The decision-maker should, in consultation with DWER, consider the cumulative impact of any land use and development changes to the broader catchment area and the potential impacts on the area subject to the rezoning proposal.

2. A proposal for a small subdivision (and resulting development) has the potential to impede the movement of flood waters along a small section of a waterway with the spatial area involving a small number of adjoining lots. Within this area, there is the potential for five more buildings to be constructed that may impede water flow in a flood event. The decision-maker should consult with DWER to understand the likely cumulative impacts and factor this into their decision.

3. A subdivision proposal in a PDWSA involves the creation of lot sizes smaller than recommended in WQPN 25. The decision-maker should, in consultation with DWER, consider the cumulative impact on the PDWSA if the larger area was to be subdivided and developed in a similar manner when making a decision.

Consistent with the guiding principle for risk management in section 2 of the Guidelines, the nature and scale of a cumulative impact assessment should reflect the significance of the water resource(s) and the level of risk from the proposal(s), including risks to intergenerational equity.

5 WATER MANAGEMENT REPORTS

A WMR addresses all water-related matters relevant to a planning proposal. It is required in most, but not all, instances to demonstrate the appropriate protection, management and use of water resources. The proponent is responsible for preparing a WMR to support their proposal, in accordance with measure 7.1(b) of SPP 2.9. Information within a WMR should demonstrate achievement of the SPP 2.9 outcomes.

In line with the Guiding Principles in section 2, the content of the WMR will depend on the level of planning process and the characteristics of the site of the proposed development. The WMR does not need to be a long or complex document, however, all water resources relevant to the site and surrounds (including cumulative and downstream impacts) should be addressed.
In addition, the information in the WMR should appropriately correspond with the level of risk to and from water resources from the planning activity.

For proposals with minimal water management matters, a separate WMR may not be required; instead the relevant information can be contained as a section of a larger planning report. Where there is no planning report accompanying the application, the relevant information may be submitted in an alternative format to the satisfaction of the decision-making authority.[1]

[1] 'Decision-making authority' is defined as the WAPC, local government or other 'responsible authority' defined under the *Planning and Development Act 2005*.

Where required, site-specific advice regarding existing data, investigations, documents and modelling should be sought from DWER, water service providers and/or the relevant State Government agencies and local government, where necessary. Where requested by a decision-making authority, DWER and/or the relevant local government will also provide advice on the adequacy of each WMR as part of the planning referral process (refer to Table 1 for WMR approval authority).

Where reticulated sewerage is not available, proposals are required to demonstrate site suitability for on-site wastewater disposal. A site and soil evaluation (SSE) should be submitted for most unsewered proposals and should be appended to a WMR, where one is required, or as a standalone report when a WMR is not required. For higher planning activities, proposals should consider wastewater servicing strategies in addition to site and soil profile more generally. Refer to section 8 for more information.

Consultation with all relevant agencies, service providers and affected infrastructure/landowners/managers is necessary to seek advice on key matters and to develop proposed management strategies. Therefore, establishment of a multidisciplinary project team (refer to Appendix A) is recommended.

The composition of the multi-disciplinary team depends on the land use change being proposed. For example, a WMR for rural and agricultural development will require expertise from a broader range of disciplines such as agricultural science, animal science, horticulture, irrigation design, soil survey and land capability assessment. This will facilitate a greater understanding of any competing objectives and provide an opportunity to optimise outcomes.

5.1 Water Management Report types

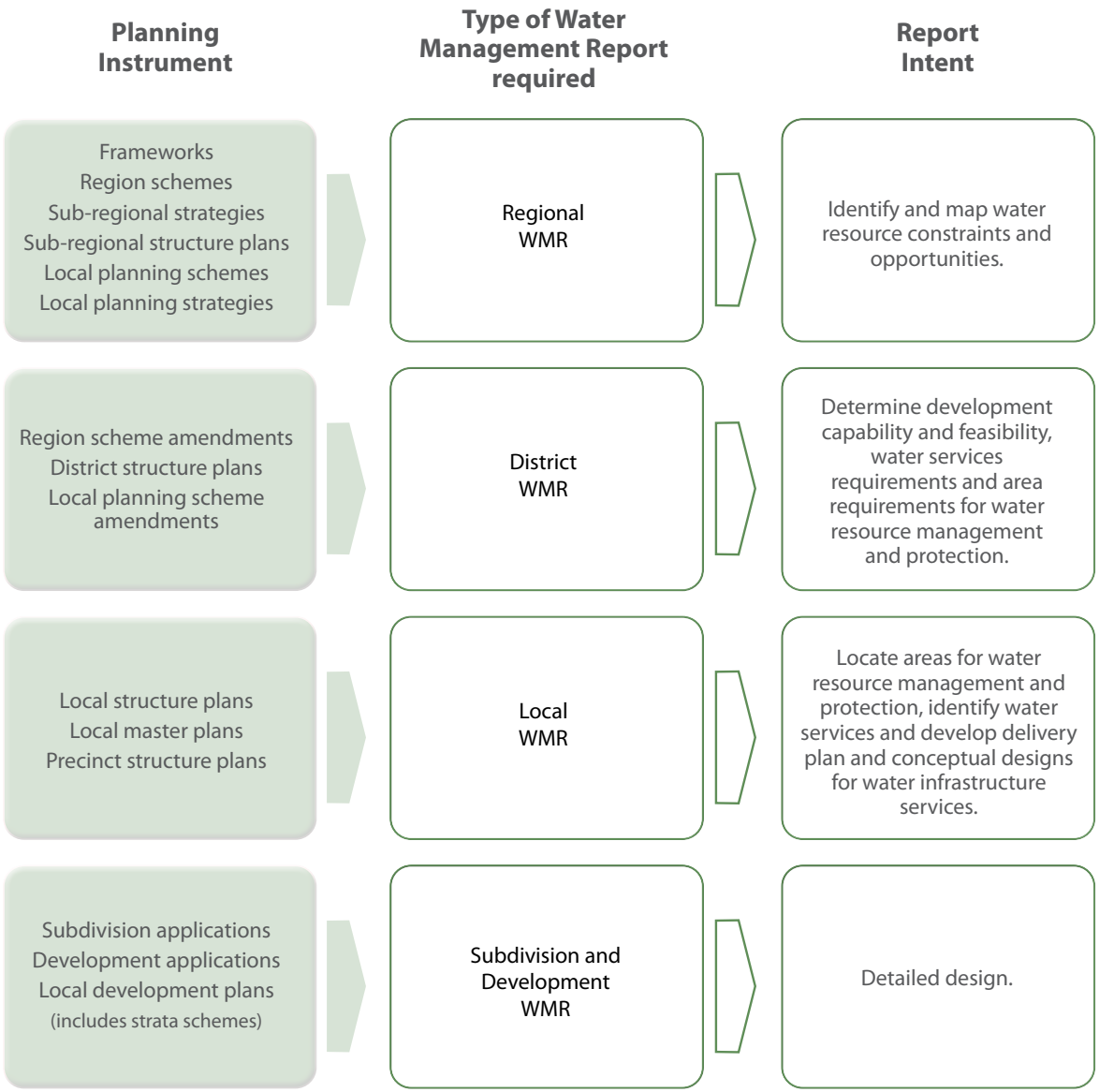
The type of WMR required should correspond to the relevant planning instrument as shown in Figure 1 and further explained in Table 1. It is recognised not all proposals will fit neatly within the WMR and planning instrument hierarchy. In this instance, the WMR will need to consider the information requirements of each level that the proposal fits into.

Additional guidance on the preparation of a WMR is provided in sections 5.2 to 5.6 and Appendices B, C, D and E. The general requirements presented in Appendices B, C, D and E are not intended to be checklists. They outline the general information requirements that may or may not be applicable in all circumstances, depending on the proposal.

The consideration of water resources should not be deferred to later stages of the planning process. By the time a project has been through regional, district and local structure planning processes, water resource issues should be adequately addressed and should not require resolution at the subdivision or development application stage where there are greater limitations to resolving them.

In addition, site-specific investigations may be required where no or limited pre-existing information is available. The cost and time needed to undertake these investigations should be identified early and factored into project schedules.

Figure 1: The WMR and planning instrument hierarchy[2, 3]



Note: A further WMR is not required if the previously approved WMR specifically states there is sufficient information and the proposal complies with the previously approved WMR.

[2] It is recognised that classifying the local planning strategy and local planning scheme as regional level tools may cause confusion. However, separating this local planning that occurs via local structure plan is the more important characteristic.

[3] Strata title schemes also extends to leaseholder-strata, survey-strata and community title development.

Table 1: Water Management Reports to inform land use planning in Western Australia

Planning stage/ instrument	Likely proponent	Notes	Type of WMR	Further Information	Responsibility for approval
Frameworks, Region schemes, Sub-regional strategies, Sub-regional structure plans	State Government	Regional WMR may be informed by State Strategies or a water supply strategy	Regional WMR	section 5.2 Appendix B	WAPC with endorsement of WMR from DWER
Local planning schemes, Local planning strategies	Local government	WMR can be presented as in a local planning scheme and/ or strategy document and/or a stand-alone document	Regional WMR	section 5.2 Appendix B	WAPC with endorsement of WMR from DWER
Region scheme amendments	State Government/ local government/ landowner/developer	A region scheme amendment proposal (including the rezoning to or lifting of urban deferred land)	District WMR*	section 5.3 Appendix C	WAPC with endorsement of WMR from DWER - in close consultation with the relevant local government(s)
District structure plans	State Government/ local government/ landowner/developer		District WMR*	section 5.3 Appendix C	WAPC with endorsement of WMR from DWER - in close consultation with the relevant local government(s)
Local planning scheme amendment	Local government/ landowner/developer	If a local planning scheme amendment is concurrently being proposed with a region scheme amendment or local structure plan, a combined WMR can be developed if water resource information is adequate for both planning instruments	District WMR*	section 5.3 Appendix C	WAPC with endorsement of WMR from DWER - in close consultation with the relevant local government(s)
Local structure plans, precinct structure plans, master plans and activity centre plans	Local government/ landowner/developer		Local WMR*	section 5.4 Appendix D	WAPC with endorsement of WMR from DWER – in close consultation with the relevant local government(s), or, with prior agreement with DWER and a designated local government (where it is not the proponent)[4]
Subdivision, development, local development plans and strata title scheme applications	Landowner/developer	Refer to section 5.5 for scenarios where a WMR will not or may be required. Condition of subdivision to be applied requiring detailed design to be in accordance with endorsed WMR and/or connect to services above.	Subdivision and Development WMR*	section 5.5 Appendix E	WAPC with endorsement of WMR from local government, or local government (where it is the decision-maker) with advice from DWER if requested

* If the previously approved WMR specifically states that there is sufficient information and the proposal complies with the previously approved WMR, a further WMR is not required.

[4] Where the local government is not the decision maker they should support the Local WMR prior to finalisation.

Local government consultation

WMRs facilitate the delivery of water-related infrastructure and assets (such as drainage networks and public open space) that will ultimately be managed and maintained by the relevant local government. In addition, local governments have significant local knowledge, which is vital input into water management planning.

Accordingly, it is important for the local government to be involved in the preparation of and, where appropriate, endorsement of WMRs. To achieve this, it is recommended water management consultants and engineers discuss critical site constraints with local government representatives and gain support for proposed strategies to address them appropriately before documenting the strategies for final endorsement.

In addition, as the lead authority for WMR endorsement (except for Subdivision and Development WMRs), DWER should consult with the relevant local government(s) during the report's assessment and endorsement. This is in line with the policy's guiding principles, particularly collaboration and site-responsive solutions.

Local governments across Western Australia vary significantly in development pressures and relevant water-related issues. Variability in resourcing, capability and ability to get involved should be considered in the context of optimal consultation.

Local government support

Where the local government is not the endorsement authority for the WMR, it should be engaged in development discussions and supportive of its content before its finalisation. This means the local government should be supportive of the report's approach to water management and the design and specification of water-related assets, particularly those it will manage in perpetuity.

In situations where the local government is not supportive of the WMR, reasonable efforts should be made by all parties to achieve consensus on an acceptable approach for all water management matters before the final decision on endorsement of the WMR is made by DWER. In some instances, a WMR will address matters of greater relevance to other stakeholders (such as arterial drainage, water supply and wastewater treatment) and their support will be important to obtain.

Ideally the level of engagement and support from the local government should increase as the water management arrangements become more detailed (i.e. moving from the district scale to the local scale and beyond) and in more complex areas where local government will assume the risks of ongoing management.

Local government leading endorsement

Reflective of current practice, a local government can request greater responsibility in the assessment and endorsement of local WMRs. Where a local government has demonstrated technical capabilities and resourcing, DWER may agree to the local government assuming a lead role in the endorsement of the local WMR.

In these circumstances, the local government is expected to consult with other stakeholders that have an interest in water management outcomes including State Government agencies and service providers.

5.2 Regional Water Management Reports

Regional level planning is generally 'high level' strategic planning, which provides a broad scale framework for development of an area in the medium to long term (five to thirty plus years). As outlined in Figure 1, regional land use planning is usually facilitated by the preparation of a regional strategy or regional structure plan. These strategies provide the broad framework for planning at the regional and sub-regional level, and the strategic context for local planning schemes and region schemes.

A Regional WMR will generally be prepared by State Government and may cover more than one local government area. A Regional WMR for a local planning scheme or a local planning strategy will be prepared by local government. The Regional WMR should be developed in consultation with the relevant State Government agencies, local government(s) and infrastructure managers/owners and be referred to DWER for endorsement before WAPC approval.

The WMR report should be attached as an appendix and summarised in a chapter of the regional/sub-regional structure plan or strategy or in the local planning scheme or strategy.

A Regional WMR is required to identify water resources, drinking and non-drinking water supplies and other issues for management that can be used to underpin planning controls in region and local planning schemes. This includes, at an appropriate scale, the identification and mapping of water resources, source of drinking water and non-drinking water, areas of catchment flooding and seasonal inundation, depth to groundwater, opportunities for alternative water supplies and infrastructure co-location.

The main water management questions a Regional WMR will need to answer include:

i. Where are water resources, PDWSAs, sensitive water resource areas and other important environments located?

ii. Where is future land use change likely and what impacts will this have for water resources management?

iii. What types of development are the areas suitable for in the context of water resources?

iv. What is the water availability in the area (existing or potential alternative sources)?

v. What water resource and infrastructure asset protection measures are needed?

vi. What water services/infrastructure may be needed (for example, public drinking water, reticulated wastewater systems and plants, and managed drainage systems)?

vii. What water matters need to be resolved in future planning?

The information used to develop a Regional WMR is likely to include the collation and analysis of existing information and mapping, consideration of policy, guidelines and legislation, broad water resource requirements, a fatal flaw assessment and summarised expectations of water resource issues to be managed. The requirements for preparation of a Regional WMR are outlined in Appendix B.

5.3 District Water Management Reports

A District WMR is prepared by a proponent to demonstrate the land can support the planning proposal and how the appropriate water resource protection and management outcomes will be delivered. The District WMR should expand on and/or address the matters identified in the Regional WMR (if one exists), and/or any other relevant water resource management study or report (including but not limited to flood studies, allocation plans, protection plans, fit-for-purpose pre-feasibility studies for drainage and a drainage and water management plan). The District WMR should also identify, in more detail, land areas required for water management.

Region scheme amendments are generally required to be informed by a District WMR. District structure plans are required to be informed by a District WMR unless a Regional WMR provides sufficient detail.

In line with the guiding principles in section 2, the level of detail required to support a local planning scheme amendment should be commensurate with the scale of the amendment (i.e. small and administrative amendments with no water-related implications may need minimal or no water-related information).

The decision-maker will refer a District WMR to DWER for endorsement, in close consultation with the relevant local government(s), State Government agencies and infrastructure managers/owners before the WAPC assesses the planning proposal.

The main water management questions a District WMR will need to answer include:

i. What are the sources of drinking water and non-drinking water for the development?

ii. Where are water resources, PDWSAs, sensitive water areas and other important environments located?

iii. Are the land and water resources capable of supporting development without adversely impacting water resources?

iv. What areas are required for water management and protection and what is left for development?

v. How will drinking and non-drinking water supplies and services be provided (for example, reticulated wastewater systems and plants, and managed drainage systems)?

vi. Will the proposed development have an impact on upstream, downstream or adjacent land?

Where appropriate, the District WMR should identify land to be set aside for water resources, major infrastructure (natural and constructed) and areas of Aboriginal heritage or other heritage value. This includes wetlands and their buffers, waterways and their foreshore areas or reserves, living stream corridors, discharges and groundwater subsoil discharges, floodwater storage areas, flow paths for major flooding and major water supply/sewerage infrastructure (such as pump stations and treatment plants) and their buffers. This information should be modelled where appropriate. The requirements for preparation of a District WMR are outlined in Appendix C.

The District WMR should identify and evaluate the water demands, water sources and delivery options for drinking and non-drinking water and wastewater disposal and reuse. If drinking water is unavailable from an existing reticulated drinking water supply network, the WMR should demonstrate the technically and financially viable options, including consideration of capital and operational costs of establishing a drinking water supply and reticulated sewerage scheme, including infrastructure planning (refer to section 8.2).

If non-drinking water is unavailable from groundwater or surface water resources, the WMR should identify technically viable and financially sustainable alternative non-drinking water source options (refer to section 8.2).

If drainage infrastructure is required to mitigate groundwater or surface water resources at risk of seasonal inundation and/or flooding, and there is no lead service provider, the WMR should identify technically viable and financially sustainable drainage infrastructure options.

Consultation should also be undertaken as early as possible with the water and wastewater service provider and local government that will supply the proposed developments. Where new wastewater, non-drinking water source and/or drainage infrastructure is required, and there is no lead water service provider, collaboration is required across State and local governments and all potential wastewater service providers.

5.3.1 Crossing local government boundaries

A coordinated approach should be undertaken between local governments, proponents and consultants when preparing a District WMR located across or adjacent to local government boundaries. Responsibilities for implementing the District WMR must be clearly defined and ensure the requirements of both local governments can be met for key issues such as flood management and infrastructure provision.

5.3.2 Fragmentation of land ownership

Land ownership is likely to be fragmented in an area of district size. Decisions will need to be made about who bears the costs and who coordinates studies. Some ways of dealing with these circumstances include a coordinated approach by several landowners or proponents, or coordination by local governments, with an agreed mechanism or arrangement between landowners for funding the study, such as through a development contribution scheme.

5.3.3 Broader catchment planning considerations

A District WMR should consider water resources and associated risks to and from the development at a catchment scale, even when the catchment (surface water, groundwater and/or flood) extends beyond the planning area. More information on catchment drainage planning is provided in section 8.6.

Critical considerations likely to require information gathering and/or modelling of the proposal area and broader catchment include:

i. flood levels and floodplain areas;

ii. incoming upstream surface water flows and downstream discharges;

iii. regional groundwater flows and levels;

iv. sensitive water resource areas;

v. waterways and their foreshore areas and wetlands and their buffers;

vi. surface water and groundwater management and their interactions;

vii. anticipated demand for and availability of fit-for-purpose water demands;

viii. pre/post development topography;

ix. adjoining tenure and land uses;

x. other pre-existing land planning approvals; and

xi. drainage, water supply and wastewater infrastructure needed to support development and protect public health and the environment.

The decision to undertake modelling or other investigations outside of the planning area should consider the site and its surrounding water resources. For example, a site located within the catchment of a wetland should consider the potential impact to the wetland from development practices, which may include clearing, filling and draining the land, changes to groundwater quality and levels, and changes to surface water flows, quality and timing, noting that the wetland's surface and sub-surface catchments may have a significant spatial extent. Certain activities, such as the taking of water for public open space irrigation, may need to be restricted in these areas or managed closely, depending on the location. This could trigger the need for alternative water sources for public open space irrigation.

Similarly, a site adjacent to a drain or waterway that receives flow from a large external catchment must consider the spatial extent of land required to manage incoming and outgoing flood flows without increasing the flood risk of the general area.

Figures 2 and 3 provide examples of where consideration of factors outside the immediate planning area have been critical to the successful development of the WMR.

5.4 Local Water Management Reports

A Local WMR is prepared by a proponent to demonstrate feasibility of the water management systems and strategies with conceptual plans and designs proposed for implementation through detailed design and development. The Local WMR should expand and/or address the matters identified in the District WMR (if one exists) and identify in more detail land areas required for water management.

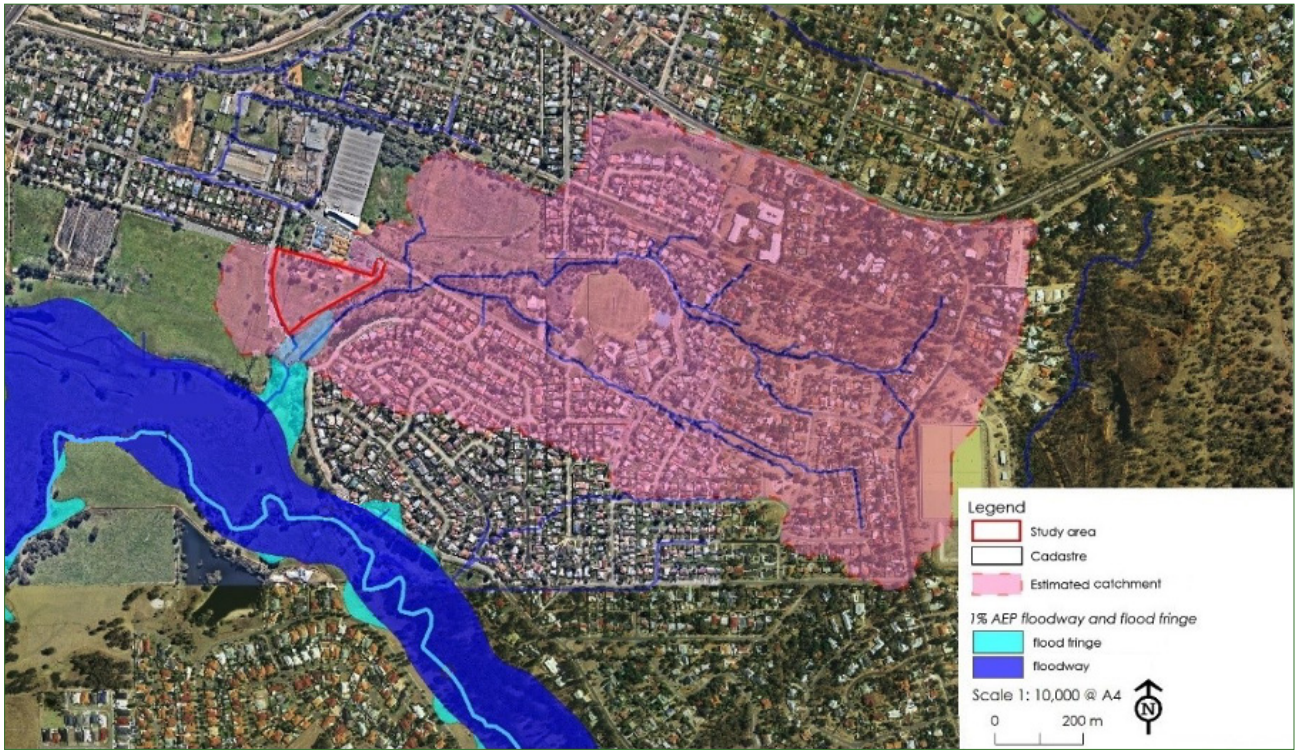
A local structure plan or precinct structure plan (including masterplans and activity centre plan) is required to be informed by a Local WMR unless a District WMR exists and provides sufficient information.

The decision-maker will refer a Local WMR to DWER for endorsement, in consultation with relevant State Government agencies (DoH, DBCA and DPIRD for instance), the relevant local government(s), and current and proposed water service providers and infrastructure managers/owners (where required) before WAPC consideration of the planning proposal. Where the local government is not the decision-maker it should support the Local WMR before finalisation.

Lodgement of a local structure plan or precinct structure plan (including masterplans and activity centre plans) is typically the first major milestone of a design process that responds to site conditions to locate public open spaces, set out lot and road layouts, as well as design the necessary systems and infrastructure that will service the future proposed land uses.

Consequently, water planning as part of the concept design is a critical element of this process and requires a preliminary design of 'whole of development' water management systems/strategies to guide future detailed designs.

Figure 2: The combined influences of riverine flooding downstream of this study area and a large upstream drainage catchment needed to be understood to ensure adequate flood protection is given to the proposed development as well as existing land uses



The Local WMR should confirm the feasibility of the preferred water supply sources, wastewater disposal and reuse options, and where possible, delivery arrangements. This includes sources of water available to meet the expected water demand for drinking and non-drinking uses. To determine the availability of groundwater and surface water on the site and to identify any potential sources of water, consultation with DWER is recommended. Consultation with the water service provider who will supply the proposed developments should also be undertaken as early as possible.

Where new infrastructure is required for wastewater, non-drinking water source and/or drainage infrastructure and no lead water service provider was determined in the District WMR, collaboration is required across State and local government and all potential water service providers to determine roles and responsibilities for water service provision at the earliest stage.

The main water management questions a Local WMR will need to answer include:

i. How will water be managed within the development? Demonstrate proof of concept (provide a short synopsis of a certain method or idea(s) to demonstrate its feasibility and set controls for subsequent planning stages).

ii. How much land is needed for water management and protection and where will it be located, including areas for treating the quality of stormwater and groundwater subsoil discharges, wetland buffers and waterway foreshore areas, protection zones, flood storage areas and major flow paths?

iii. Who will deliver services (water, sewerage and water for public open space), where will the services be located, are these services secured and when will they be provided?

Figure 3: The protection of wetlands and coastal areas adjacent to and beyond this study area are a critical component of district planning

Where a local structure plan or precinct structure plan is amended, and these changes may have an impact on water management and protection, the Local WMR should be updated to explain the impact of these changes.

This may include changes to residential density, drinking and non-drinking water sources, amount of flood storage area, proximity of development to sensitive water resource areas, waterways and their foreshore areas and wetland and their buffers. The requirements for preparation of a Local WMR are outlined in Appendix D.

5.4.1 Planning considerations for staged developments

A Local WMR is required to address the entirety of the proposal area and provide enough detail to demonstrate feasibility of the water management systems and strategies, water supplies and acceptability of water resource protection. For multi-stage developments it is reasonable to provide differing levels of detail for the various stages. The first stage of the development will act as a 'template' for subsequent stages, demonstrating street and lot scale systems, while still providing critical information for major elements of the design at a broader scale for the whole structure plan area.

Figures 4a (top) and 4b (bottom) are examples of stormwater management systems layouts for a multi-stage development; figure 4a being the local structure plan for the total site area and figure 4b an example of a staged development structure plan with successive stages to follow.

Figure 4a: Local structure plan for the total site area

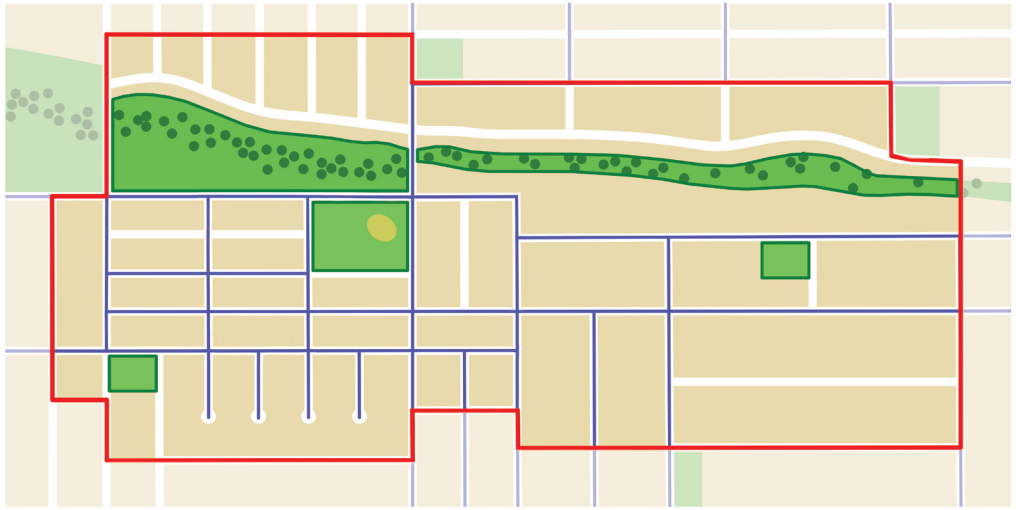
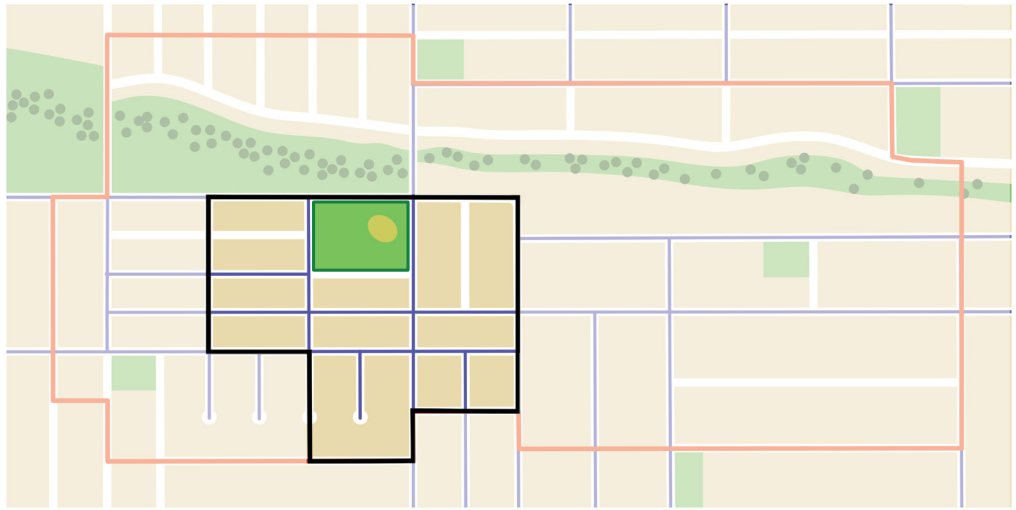


Figure 4b: Local structure plan for stage one



5.5 Subdivision and Development Water Management Report

A Subdivision and Development WMR is required to demonstrate in detail that all water matters within or impacting on the site will be appropriately managed.

1. A Subdivision and Development WMR **will not** be required where:
   a) the site will be connected to services including drinking water, wastewater and drainage systems to the satisfaction of the water service;

   and

   b) sufficient information has been provided, to the satisfaction of the decision-maker, which demonstrates the proposal is unlikely to adversely impact on or be impacted by further water systems or water resource planning;

   or

   c) there is an approved WMR (usually Local WMR), which provides guidance for development of the site, confirms no further WMR is required and the proposal does not significantly differ from the approved WMR[5].
2. A Subdivision and Development WMR **may** be required when lodging a subdivision or development application in any of the following instances (only where it has not been addressed in an earlier stage of the planning process):
   a) no prior approved WMR has been prepared that is relevant to the specific subdivision or development;
   b) a prior approved WMR exists but provides insufficient detail to properly inform detailed design;
   c) where the proposal deviates from the requirements of a previously approved WMR;
   d) the proposal is impacted by any published floodplain mapping or contains areas designated as 'floodway' or the site is located on land likely to be impacted by flooding where no floodplain has been defined;
   e) finished ground levels and/or the area required for drainage have not been identified;
   f) the site is located within a PDWSA or within or adjacent to sensitive water resource areas;
   g) there is a risk the development will significantly disturb acid sulfate soils or soil or groundwater contamination associated with a registered contaminated site;
   h) the proposal may cause an increase in saline groundwater discharge because of native vegetation clearing;
   i) connection to existing drinking water, wastewater and/or drainage systems is not currently possible;
   j) wastewater treatment and disposal is proposed on a site located within a PDWSA or mapped sensitive water resource area;
   k) irrigation with nutrient-rich wastewater or fertigation is proposed;
   l) where a subdivision or development is directly adjacent to a waterway or a wetland;
   m) the site contains high groundwater or surface water; and/or
   n) construction of a new drain or modification of an existing drain is proposed.

In determining whether a Subdivision and Development WMR may be required, proponents in consultation with decision-makers should consider the size, characteristic and/or complexity of the proposal in accordance with the Guiding Principles (refer to section 2). There may be proposals where water resource matters can be addressed to the satisfaction of the decision-maker without a WMR.

If a WMR is required, it is to be submitted to the WAPC and/or local government as part of the planning application to inform the assessment. The Subdivision and Development WMR requires consultation with DWER (and other relevant State Government agencies whose functions may be impacted) before approval of the subdivision or development application by the WAPC or local government. Where justified, the WAPC, in agreement with the applicant, may extend the determination period of 90 days to allow further information to be provided.

Where an approved Local WMR exists, the Subdivision and Development WMR will be required to be lodged and approved before any site works as a condition of subdivision or development approval. Where no approved Local WMR exists, the Subdivision and Development WMR will be required upfront and will form part of the subdivision or development application.

[5] A proposal is considered consistent with the approved Local WMR when there have been no changes to the design that could impact on water resource management of the site. Changes that could impact on water resource management could include but are not limited to changes in: density or land use, size and location of public open space, waterway foreshore or wetland buffers and significant changes to stormwater management.

The main water management questions a Subdivision and Development WMR will need to answer include:

i. How much land is needed for water management and protection and where will it be located (for example, identification of wetland buffers and waterway foreshore areas)?

ii. What should the refined infrastructure design look like?

iii. How will the detailed design and proposed operations of the proposal prevent or reduce impacts to water resources (including downstream environments)?

iv. How will dewatering be managed to ensure that impacts to other important environments are avoided?

v. How will the detailed design protect and manage water resources, PDWSAs and sensitive water resources areas?

vi. Who will deliver water services (i.e. drinking and non-drinking water, drainage, and wastewater), are these services secured and when will they be provided?

vii. Will the proposed water management system be sustainable?

The requirements for preparation of a Subdivision and Development WMR are outlined in Appendix E.

5.5.1 Infill

Decisions related to infill proposals should be supported by sufficient information, as determined by the decision-making authority, to demonstrate the existing water systems and services have the capacity to support future development, including sewerage, drinking and non-drinking water (including for public and private open spaces), flood storage, stormwater management and high groundwater management. In addition, consider the cumulative impacts of similar developments within the catchment, including the potential for groundwater rise.

Where appropriate, infill projects should be informed by a WMR that is likely focused on capacity of existing systems and services. Consideration of replacing ageing or inadequate infrastructure with multi-functional systems to improve amenity, water quality and efficiency may be necessary.

5.6 Process for preparing a Water Management Report

To optimise outcomes for both water resources and the proposed land use and development, the following seven-step process will assist in the preparation of WMRs.

5.6.1 Step 1: Site and development context

Identify which planning instrument the proposal represents (refer to Figure 1) and confirm the required WMR. Identify any relevant existing approved WMRs and other relevant water studies, plans or reports.

In addition, to address the outcomes and apply the measures of SPP 2.9, an understanding of the site and development context is required. This includes an understanding of the built and natural features and their relationship to the broader context of the surrounding

area to establish whether this will influence the design of the development. It is critical the site and development context influences are considered in an integrated and iterative manner so that place-responsive outcomes can be optimised.

5.6.2 Step 2: Consideration of important environments

Identify important environments to inform the relevant WMR.

To assist in the identification of important environments, a review of the below information sources is recommended. This includes, but is not limited to:

i. sensitive water resource areas (refer to policy map of Sensitive Water Resource Areas);

ii. Swan Canning river system (refer to policy map of Swan Canning River System);

iii. Peel-Harvey coastal plain catchment (refer to policy map of Peel Harvey Coastal Plain Catchment);

iv. PDWSA (refer to policy map of Public Drinking Water Source Areas);

v. other waterway and wetland mapping;

vi. Ministerial Statements (EPA) and implementation conditions; and

vii. other environmental datasets and existing studies.

Other important environments include, but are not limited to:

viii. significant ecosystems as identified in the *Environmental Factor Guidelines: Inland Waters* (EPA, 2018) (such as regionally significant natural areas, threatened and priority ecological communities, flora and fauna; remnant native vegetation and ecological linkages, and significant public amenity, recreation and social values);

ix. water resources protected by Environmental Protection Policies under Part III of the *Environmental Protection Act 1986*;

x. clearing controlled land under Part IIA of the *Country Areas Water Supply Act 1947*;

xi. waterway management areas under the *Waterways Conservation Act 1976*;

xii. environmentally sensitive areas under the *Environmental Protection Act 1986*;

xiii. Aboriginal heritage consistent with the *Aboriginal Heritage Act 1972*;

xiv. State Heritage Places under the *Heritage Act 2018*;

xv. matters of national environmental significance under the Australian Government's *Environmental Protection and Biodiversity Conservation Act 1999* (for example, world heritage properties, national heritage places, habitats of migratory species and nationally threatened species and ecological communities);

xvi. Bush Forever sites as identified by State Planning Policy 2.8 Bushland policy for Perth Metropolitan region;

xvii. the conservation estate (for example, national parks, nature reserves and regional parks) and areas reserved through the planning process for purposes that include conservation; and

xviii. cave and aquifer ecosystems.

Following the identification of important environments, the relevant WMR should capture how they can be protected and sustained. This requires consideration of hydrological conditions (water quality and quantity), the hydrological processes that support these environments (refer to section 5.6.3), as well as physical protection measures such as revegetated wetland buffers and waterway foreshore areas and/or reserves (refer to section 6).

5.6.3 Step 3: Understanding hydrological processes

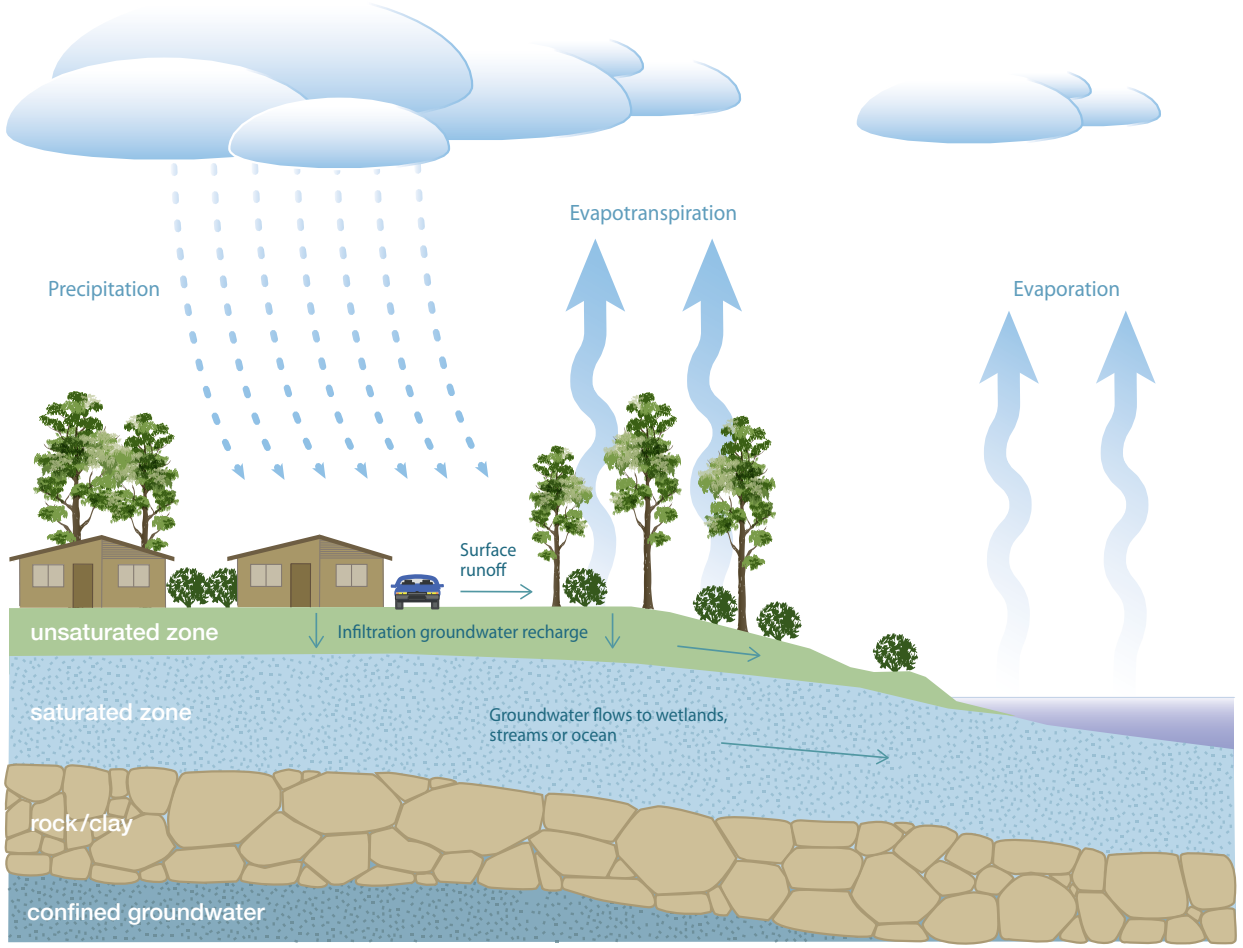
Understand and communicate the hydrological processes of a site in order to deliver site-specific solutions.

For example, sites with sandy soils and little evidence of surface water flows require a different design response to sites where water is evident at the surface in waterways, wetlands, waterlogged soils or where groundwater is close to the soil surface. **Figure 5** shows the components of the water cycle or hydrological cycle.

There is a need to understand the surface water and groundwater fluxes of the area and how this is related to the hydrological regimes of the site. Depending on the complexity of the area, this could be done using a mass water balance or modelling exercise such as a catchment or local area model. This will enable a preliminary assessment of how much water is allocated to existing uses (natural and consumptive). This tool could also be used to enable a preliminary assessment of how much water will be available for use after development and to provide a preliminary indication of the need for alternative water sources, so opportunities for other fit-for-purpose sources can be identified. DWER's drainage and water management plans may also provide this type of information.

Generally, the most successful approach to designing with water is to mimic the dominant natural processes and water movement pathways and be guided by observable signals in soils, landform and vegetation types. As a result, the best way to understand the hydrological processes is

Figure 5: The hydrological system (DWER 2004 to 2007)



to visit the site and use site-specific, fit-for-purpose data to identify the water resource context and answer the following questions:

i. What is the history of the site and surrounds that may have left a legacy of contamination or nutrient enrichment and may require remediation or careful management?

ii. What hydrological processes support the existing water-dependent environmental values?

iii. What are the existing water sources and the environments, people and activities that they support?

iv. Can existing water systems be adapted and integrated so the development can be placed on the site?

v. Are there any other key risks that may result from development of the land, which relate to water resources such as flood risks, acid sulfate soils, low phosphorus-retaining soils contaminated sites, high groundwater and on-site wastewater disposal constraints?

5.6.4 Step 4: Fit-for-purpose water sources, wastewater and drainage service delivery

Identify sustainable fit-for-purpose water sources, wastewater and drainage management solutions to inform and integrate with land planning.

The availability and suitability of drinking water and non-drinking water sources and the required government approvals should be considered early in the planning process to facilitate solutions that are efficient and cost-effective[6]. Specifically, water supply, wastewater and drainage service delivery options should be identified, and assessed, and a preliminary concept developed when preparing a District WMR.

Feasibility should also be demonstrated when preparing a Local WMR. This requires the consideration and quantification of water demands and wastewater streams resulting from a development, including:

i. drinking water and household use (such as gardens, showers, toilets, swimming pools, vehicle washing);

ii. irrigation (such as for public open space, schools, recreational facilities, horticulture, agriculture);

iii. manufacturing and processing; and

iv. construction.

With an understanding of the likely water demands, consideration can be given to the potential water sources that may be applied to meet those demands. Although conventional development results in separate systems for water, wastewater and drainage, opportunities for integrated solutions should be considered where possible This may include:

1. drinking water from integrated supply systems and/or desalination plants;

2. groundwater and surface water including water licences obtained via trades, transfers or leases;

3. stormwater harvested from an impervious surface, or drainage system (subject to ecological water requirements being met for receiving environments);

4. rainwater harvested on-site;

5. sub-surface drainage water;

6. greywater or wastewater generated and treated on-site;

7. treated wastewater sourced from an integrated collection network (sewer mining); and

8. treated wastewater sourced from a centralised treatment plant.

For large-scale developments, staged implementation of final servicing solutions will also be required and included in the preparation of a WMR.

Based on risk, this should include sufficient details about the controls and criteria required to guide subsequent planning stages, the planning controls and, where relevant, to inform developer contribution plans.

It is important to thoroughly investigate the land use planning impacts, regulatory processes (for example, licence, permit or monitoring requirements) and approvals pathways of decision-making authorities associated with different water sources, wastewater and drainage systems. This is to determine the impact on the developable land and economic feasibility of a project. For example, land may be needed for treatment plants, odour and noise buffers, pump stations and bore infrastructure.

In addition, it is important to consider who will take responsibility for the ongoing operation of any fit-for-purpose water source. In the case where the water source is less conventional (for example, sewer mining), consideration of who will operate and maintain the assets needs early consideration and buy-in. In some cases, this may involve coordination with a water service provider, the local government or a third-party specialist. It is critical there is clarity between the proponent and service

[6] DPLH has developed a calculator as a method of assessing rainfall as an alternative water source for rural living proposals where reticulated water is not available – refer to DPLH's website to access this tool.

provider/local government/third-party specialist as to who will inherit the scheme, what the required service strategy or maintenance plan is, and how this will be funded.

5.6.5 Step 5: Consideration of critical site conditions

Consider critical site conditions and issues that may trigger a requirement for more detailed investigations and analysis.

These site conditions include, but are not limited to:

i. contaminated sites and acid sulfate soils;

ii. highly permeable sandy soil with poor phosphorus retention capacity;

iii. water balance change;

iv. PDWSAs;

v. sensitive water resource areas and other important environments;

vi. limited available drinking or non-drinking water resources;

vii. water and wastewater service infrastructure capacity and capability upgrades (considering staging);

viii. multiple or fragmented landownership;

ix. inundation, perched water tables, heavy soils, presence of rock outcrops;

x. mosquito/midge/disease vector management and control;

xi. flood or significant inundation risk;

xii. high groundwater systems and dewatering or drainage requirements; and/or

xiii. proposals involving land uses with potential to impact on water quality.

The following investigations and assessments may need to be undertaken to address site-specific risks and issues:

1. Monitoring and site investigations

To gain an understanding of the site's existing environment, its ability to support development and appropriate water management systems, monitoring and site investigations should be undertaken. These should be targeted and should consider the effects of seasons (winter/summer and wet/dry) and episodic variations where relevant. Monitoring is an iterative process and as such the duration will depend on several factors including but not limited to:

a) the level of risk to and from the water resources being monitored;

b) seasonal and episodic variability;

c) proposed land use management approaches; and

d) results presented by the monitoring.

Monitoring should therefore start as soon as possible and factored into development timeframes. For more information refer to *Water monitoring guidelines for better urban water management strategies and plans* (DoW, 2012).

2. Detailed site water balance

A detailed site water balance may be undertaken to understand and quantify the potential impacts and opportunities associated with various land uses and water management actions to provide for and sustain the environment and guide the design of water management and use strategies. For example, a detailed site water balance may reveal an opportunity to collect and store water for future reuse as a fit-for-purpose water source that would have previously occurred in the landscape and eventually evaporated away. Considerations that may result in significant changes to the site water balance include:

a) changes to groundwater levels or groundwater quality that could impact on PDWSA, sensitive water resource areas, water-dependent ecosystems or terrestrial vegetation;

b) increased recharge and/or reduced evapotranspiration raising groundwater levels and inundating public and private open spaces and/or damaging infrastructure or built form;

c) changes in the volume, quality, seasonality or direction of surface water flows causing hydrological changes that could impact on PDWSA, sensitive water resource areas, water-dependent ecosystems, downstream water users and/or terrestrial vegetation;

d) on-site wastewater disposal and reuse;

e) water brought in from offsite sources to support proposals; and/or

f) potential impacts of climate change.

3. Modelling of critical water systems

Modelling of critical water systems (surface water and/or groundwater) may need to be undertaken to quantify flood risk, predict flows, levels and/or water quality in response to different land uses, activities and management options and enable site-responsive designs for water management systems and the surrounding development.

4. Water demand analysis

A water demand analysis for an alternative servicing strategy may need to be undertaken to consider and identify opportunities for alternative drinking and non-drinking water sources, water and wastewater servicing approaches and strategies to meet the expected drinking and non-drinking water demands.

5.6.6 Step 6: Consideration of management approach

Identify a management approach in all WMRs that provides for the delivery and ongoing sustainable management of water resources and infrastructure as a key consideration of the planning and development process.

Accordingly, collaboration with all relevant stakeholders and/or the project team will ensure appropriate water management measures are supported by the owner of the water resources and/or infrastructure. Key considerations for implementation and asset management planning for water infrastructure include:

i. water management systems designed to retain and restore healthy ecosystems and maintain the hydrological regime;

ii. water management systems designed for the long-term protection of water resources;

iii. identification of who will deliver the infrastructure in the short-term, how it will be delivered and when;

iv. identification of an appropriate long-term asset manager and ceding of any associated land free of charge;

v. identification of the long-term suitability for on-site wastewater disposal without compromising public health and the environment;

vi. identification of appropriate maintenance regimes for water management assets and systems;

vii. potential climate change mitigation measures and provision for their future implementation;

viii. monitoring and reporting in accordance with approved monitoring program and maintenance plan; and

ix. financial viability of water infrastructure after development, particularly where non-traditional approaches are proposed.

5.6.7 Step 7: Future investigations

Clearly identify requirements for future stages of planning and development in all WMRs.

The findings of investigations and analysis undertaken for previous planning stages should be used as the basis for further investigation and planning decision-making at subsequent stages. Where further investigations are required these should be clearly stated in the WMR, including details of what investigations are required, the purpose of the investigation, when it is to be completed and by whom. The endorsed WMR is required to contain one of the following statements by the decision-maker:

"More detailed Water Management Reports will be required to support future planning decisions in this proposal area."

Or

"This Water Management Report contains sufficient detail to support a future planning decision within the proposal area and therefore no further Water Management Report will be required in accordance with the Water Guidelines."

For multi-stage developments or in other situations, it may be necessary to provide an updated WMR for approval in response to changes in site conditions, policy requirements and/or community expectations. When a proposal or design is significantly changed, any prior approval of a WMR will not be considered valid.

6 ENVIRONMENTAL, SOCIAL AND CULTURAL VALUES

6.1 Wetlands and waterways

Wetlands and waterways provide a range of ecosystem functions, including providing habitat for a wide variety of fauna and flora, cultural significance and value for public recreation and social amenity. They also reduce the impacts of flood by storing and detaining stormwater, improve water quality by trapping sediments, and capture and store nutrients and other pollutants. Consequently, development should, where possible, seek to protect and restore wetlands and waterways, recognising their value as ecological assets as well as providing social benefits including recreation, improved mental and physical health and urban heat mitigation.

The ecological integrity of wetlands and waterways are protected and enhanced through the establishment of wetland buffers and waterway foreshore areas that maintain and/or improve the physical condition, ecological health, functions, values and community benefits of waterways and wetlands. Waterway foreshore areas and wetland buffers allow for future restoration where degradation has occurred (for example, realignment of straightened channels, controlling erosion and restoration of endemic native vegetation).

Waterway foreshore areas and wetland buffers function by:

i. separating a waterway or wetland from the adjacent land use(s) and related activities that pose risks to their values, including habitat modification and loss, changes to hydrology, declining water quality, weed incursion and damage by people, vehicles and animals;

ii. reducing the chance a waterway or wetland may adversely affect the surrounding land use(s) (for example, through flooding, hydrological change or midges and mosquitoes);

iii. maintaining the ecological processes and functions of the waterway or wetland; and

iv. providing habitat important for many native flora and fauna species.

For foreshore areas and wetland buffers to perform their protective functions, ecological linkages and the allocation of enough land for an appropriate width of healthy native vegetation is critical and should be identified and considered as early as possible in the planning process. This should occur as part of the preparation of WMRs, consistent with *Environmental Guidance for Planning and Development: Guidance Statement 33* (EPA, 2008) and *Operational Policy: Identifying and Establishing Waterway Foreshore Areas* (DoW, 2012) and Appendices B, C, D and E of the Guidelines.

Waterway foreshore areas and wetland buffers assist with protecting water quality. However, they are not designed to protect water quality from the land uses described in section 6.3 of the Guidelines. Where these land uses are proposed near a waterway or wetland an additional separation distance may be required. The additional separation distance should consider the values, features

and functions of the wetland or waterway, the water quality risk and vulnerability of the wetland or waterway, topography, stormwater velocities and the effectiveness of measures designed to minimise nutrient and non- nutrient contaminant export.

Different methods are used to identify land for waterway foreshore areas and buffers for wetlands to ultimately be reserved in a region scheme or local planning scheme. For this reason, it is important to first determine whether a given ecosystem is a waterway or wetland (refer to SPP 2.9 Definitions and SLIP dataset). In cases where it is not clear, proponents should seek advice from DBCA and DWER.

6.1.1 Identifying waterway foreshore areas

A foreshore area is the land that adjoins or directly influences a waterway. It is the area of transition between the edge of the waterway channel and the farthest extent of riparian vegetation, the floodplain and riverine landforms.

A preliminary foreshore area should be identified as part of a District WMR and refined as part of a Local WMR. The dimensions of foreshore areas are site-specific and based on the defined floodway (refer to section 7.3), climate, hydrology, ecological, social and cultural values, biological and physical features of the waterway, including erosion and other channel formation processes that may change its shape and direction (morphology). They are also based on features such as embankments, consideration of disease vector and nuisance insects (such as mosquitoes and midges), provision of suitable public access, and the existing and proposed adjacent land uses.

Foreshores are often variable in width along a section of a waterway according to the size of the watercourse or body of water and the condition of its banks, shore or coastline. The widths of the foreshore should be indicated in the WMR and measured separately for each bank outwards from either the outer edge of riparian vegetation or the high-water mark (bankfull) level, whichever is the greatest. The width of the foreshore area or reserve from each edge of the waterway should be a minimum of 30m for waterways and a 'development setback' of 50m for estuaries, or greater as outlined above to reflect site-specific features and conditions. This will provide for ongoing protection of the environment, and cultural and social values of the foreshore and waterway.

The foreshore area is a negotiated distance with DWER (or DBCA for foreshores within or abutting the Swan Canning Development Control Area). DWER (and/or DBCA) advice is provided to the land use planning decision-maker. Foreshore widths of less than 30m for waterways or a development setback of 50m for estuaries are generally not considered to provide adequate protection for the ecosystem.

In limited circumstances, where site-specific constraints exist, such as topography, management and accessibility complexities, exceptions to the minimum width of the foreshore may be granted. In these circumstances, a non-standard foreshore width that adequately protects the waterway may be requested and justification will be required.

Operational Policy: Identifying and Establishing Waterway Foreshore Areas (DoW, 2012) and Determining Foreshore Reserves (Water and Rivers Commission, 2001) provide guidance on the method for identifying and establishing a waterway foreshore reserve. The land uses and activities that are compatible with them, and the checklist of threats and issues to consider for waterways are provided in chapter B5 of *Guidance Statement 33: Environmental Guidance for Planning and Development* (EPA, 2008).

Foreshore areas should be planned with sufficient distance between the waterway and adjacent land use(s) to allow for or to accommodate:

i. unimpeded movement of floodwaters during major flood events;

ii. conservation of the waterway environment, including riparian vegetation;

iii. maintenance of the natural hydrology of the waterway;

iv. rising water levels and storm surge, including consideration of climate change;

v. management of pests and weeds, specifically declared plants;

vi. public access and recreational use of the foreshore and the waterway, where appropriate;

vii. no new installation or placement of public utility infrastructure (for example, electricity, gas and sewerage) or on-site wastewater management systems;

viii. potential views of the waterway from public places;

ix. protection and enhancement of landscape and landform, where needed;

x. adequate separation distance from disease vector and nuisance insects such as mosquitoes and midges (refer to DoH for guidance on mosquito management); and

xi. no direct discharge of stormwater runoff and/or mobilised groundwater (for example, via pipes and drains) consistent with the *Decision Process for Stormwater Management in Western Australia* (DWER, 2017).

6.1.2 Identifying wetland buffers

A wetland buffer is an area of (usually) terrestrial land immediately surrounding a wetland that provides spatial separation between the wetland and adjacent land use(s).

The process to determine an appropriate wetland buffer should be on a case-by-case basis and consider the physical characteristics relevant to the wetland, including the wetland values, attributes and the surrounding land use. Based on the physical characteristics of a wetland, a negotiation buffer can be achieved. Further guidance on the determination of appropriate and functional buffers between wetlands and proposed land uses is contained in *Guidance Statement 33: Environmental Guidance for Planning and Development* (EPA, 2008) and in the *Draft Guideline for the Determination of Wetland Buffer Requirements* (WAPC, 2005).

Advice can also be sought from DBCA regarding the identification of wetlands to be protected, including mapping datasets, evaluation methodology, wetland boundary delineation, buffer restoration and preparation of wetland management plans. Further advice on hydrology can be sought from DWER.

6.1.3 Ownership and management requirements for wetland buffers and waterway foreshore areas

Foreshore areas and wetlands and their buffers identified in planning proposals may be reserved in region schemes or local planning schemes and placed in public ownership. This is to prevent the area from being used for any other land use purpose to allow for seasonal fluctuations and increases in water levels, as well as in some cases to allow people to access the area for recreational purposes. Following reservation in a region scheme or local planning scheme, a management order may be placed on the reserve to ensure it will be managed by a local government or a State Government agency for purposes such as foreshore protection and public recreation or conservation.

The relevant WMR should identify the appropriate waterway or wetland manager before the approval of the foreshore reserve or wetland buffer and prior to ceding.

Significant wetlands and their buffers, and waterways and their foreshore areas may be required to be ceded to the Crown free of charge at subdivision stage, in accordance with section 152 of the *Planning and Development Act 2005*. Where public acquisition of private land planned for future foreshore reserve or wetland buffer purposes is not likely to occur (for example, due to public access) in the short or medium term, the development should not be permitted within the likely area of reservation if it is likely to impact on the natural values of the land, or if it would prejudice its timely transfer to the Crown in the future. Instead, the WAPC would support proposals for adjoining or nearby property owners to lease the reserve until public control is seen to be necessary.

Where the WAPC requirement for provision of a foreshore management reserve necessitates a boundary survey of the reserve, where such a survey would not otherwise be required, the proponent should discuss appropriate arrangements to meet the cost of surveying the reserve with the WAPC.

Where a wetland and buffer are identified, a Wetland Management Plan should be prepared to support a subdivision application or as a condition of subdivision – refer to *DBCA's Guidelines checklist for preparing a wetland management plan* (Department of Environment and Conservation, 2008).

Public ownership as a reserve is preferred, particularly where there are conservation, water resource, amenity or recreational values or other public uses. In limited cases, wetlands and their buffers, and waterways and their foreshore areas will remain in private ownership. This is generally less desirable as management practices may be inconsistent across multiple landowners and public access may be restricted. In these circumstances, the options for protection in the planning process are:

i. a conservation covenant;

ii. a restrictive covenant;

iii. applying conditions that ensure building envelopes are located outside of the buffer or foreshore area and where appropriate, requiring the installation of wildlife-friendly fences or other barriers;

iv. preparation of a wetland or foreshore management plan; and/or

v. provisions within a local planning scheme or WMR that require the preparation of a foreshore or wetland management plan.

Where a wetland and buffer or waterway foreshore area are identified, a wetland management plan or foreshore management plan should be prepared to support a subdivision application or as a condition of subdivision.

For wetland management plans, refer to DBCA's Guidelines checklist for preparing a wetland management plan (Department of Environment and Conservation, 2008). For foreshore management plans, contact DWER for advice.

The level of detail required within a wetland management plan or a foreshore management plan will vary depending on the nature of the water resource, its condition and the scale of the planning proposal. Accordingly, the plan may be incorporated as part of the WMR or for larger proposals may be a separate stand-alone report.

6.1.4 Sustainable management of wetlands and waterways

The establishment of appropriately vegetated wetland buffers and waterway foreshore areas helps manage threats to the long-term health of wetlands and waterways. However, it should be recognised that wetlands and waterways in developed areas generally require ongoing management. These issues and the key design elements below should be addressed in the relevant WMR.

For further guidance on the management and restoration of wetlands refer to *A Guide to Managing and Restoring Wetlands in Western Australia* (Department of Environment and Conservation, 2012). For further guidance on the management and restoration of waterways refer to the *River restoration manual – a guide to the nature, protection,*

rehabilitation and long-term management of waterways in Western Australia (Water and Rivers Commission and Department of Environment, 1999–2003).

6.1.5 Bushfire risk and management of buffer and foreshore areas

Waterway foreshore areas and wetland buffers may contain vegetation that is bushfire prone. This has implications for bushfire risk management and the design of future land developments in their vicinity. Consideration of bushfire risk management in accordance with *State Planning Policy 3.7 Bushfire* and the development of a bushfire management plan are likely to be required.

Bushfire management plans should be developed after the identification of the waterway foreshore area and wetland buffer and consider any future waterway foreshore area or wetland buffer restoration plans. No bushfire mitigation strategies are to be contained within a waterway foreshore area or wetland buffer.

6.1.6 Works on a wetland or waterway/ watercourse[7]

Permits are required from DWER under the *Rights in Water and Irrigation Act 1914* to undertake works that obstruct, interfere or destroy the bed or banks of a watercourse or wetland (for example, works relating to pumps, dams, crossings, boat ramps or jetties) in proclaimed surface water areas, rivers and irrigation districts. Permits are also required in unproclaimed areas where the taking, storing or diverting of water is involved and the watercourse or wetland is accessed by road or reserve. Proposals are likely to require a permit if they include any of the following activities:

i. clearing of native vegetation in the watercourse or wetland;

ii. altering the route or profile of the watercourse or wetland in any way;

iii. excavating the watercourse or wetland bed or banks;

iv. filling, stockpiling material and operating earth moving machinery on the watercourse or wetland bed or banks;

v. interfering with existing flow regimes through watercourses by dams, weirs, pits, pumps, drains or pipelines;

vi. obstructing flow with material or objects and causing water to pond and inundate land and native vegetation;

vii. drilling, blasting or other exploration activities in the watercourse or wetland;

viii. constructing structures in or across the watercourse or wetland, including dams, roads, culverts, causeways or crossings, riffles, pylons or fish ways; and

ix. carrying out any other activity that interferes with riparian areas, pools or the water table in such a way that it alters the natural environment, interferes with the existing flow of water or the use of that watercourse or wetland by others.

Refer also to section 8.3.

[7] 'Watercourse' is the term used under the *Rights in Water and Irrigation Act 1914*.

6.2 Sensitive water resources

6.2.1 Identifying sensitive water resources

SPP 2.9 requires proposals to identify and protect sensitive water resources. This should be addressed in all WMRs and relevant proposals. Sensitive water resources can be identified through:

i. 'Sensitive water resource areas' as defined in the definitions of SPP 2.9 and the policy map of sensitive water resource areas. The water resources and adjoining lands are mapped at a state-wide level to support planning decisions. Development within these areas has the potential to affect water-dependent ecosystems recognised at either or state or national level as having high ecological, social and/ or economic values.

ii. Any additional significant water ecosystems identified through site-specific investigations and advice provided in accordance with *Environmental Factor Guidelines – Inland Waters* (EPA, 2018).

6.2.2 Protection of sensitive water resource areas

Sensitive water resource areas will generally require a high level of protection and management.

All sensitive water resource areas should be identified in the relevant WMR with appropriate management measures identified. For example, sensitive water resource areas can be protected through:

i. retention, and where possible, enhancement of vegetation (including endemic species where possible), and ecological linkages within these areas;

ii. appropriate siting, design and management of land uses with potential to impact on water quality (refer to section 6.3);

iii. consideration of the potential impact of a proposal on hydrological regimes;

iv. development managed in accordance with the *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022) and *Decision Process for Stormwater Management in Western Australia* (DWER, 2017);

v. appropriate disposal of wastewater; and

vi. the consideration of cumulative impact on water quality and hydrological regimes.

6.3 Water quality

A key outcome of SPP 2.9 is to maintain or enhance water quality through ensuring that future development is sited appropriately, and measures are in place to manage the risks associated with elevated levels of nutrients and/or potential contaminants.

Proposals should prevent an increase in, or where possible reduce, nutrient loads and all other contaminants entering water resources. Water quality can be managed through the following means:

i. Stormwater and groundwater management systems designed in accordance with WSD principles and practices. Development should not result in an increase in nutrient loads into receiving waters, including groundwater. DWER's Urban Nutrient Decision Outcomes tool or an equivalent alternative, may be used to evaluate nutrient reduction decisions for urban development.

ii. Management of sediment associated with site works. Detailed information on industry best practice for erosion control is available on the International Erosion Control Association (IECA) Australasia website, Sediment Management page of the Perth NRM website and provided in *Best Practice Erosion and Sediment Control* (IECA, 2008).

iii. Identification and management of contaminated sites. Contaminated sites are regulated by DWER through the *Contaminated Sites Act 2003* and *Contaminated Sites Regulations 2006*. Where a known or suspected contaminated site is present, the WMR should identify the location and condition of the site(s) with reference to separate documents and processes being undertaken in accordance with the *Contaminated Sites Act 2003* and *Contaminated Sites Regulations 2006*.

Where there are specific requirements relating to water management within and surrounding the known or suspected contaminated site, these should be identified and considered in the development of conceptual water management designs. Practitioners are expected to refer to the *National Environment Protection (Assessment of Site Contamination) Measure 1999* and DWER guidelines when conducting site assessments.

iv. Identification and management of acid sulfate soils in accordance with *Acid Sulfate Planning Guidelines* (DPLH, 2008). The *Acid Sulfate Planning Guidelines* outline how acid sulfate soils are to be addressed at various stages of the planning process.

    Where a site has been identified, more detailed investigations should be undertaken before ground disturbing and/or groundwater disturbing activities. *Identification and Investigation of Acid Sulfate Soil and Acidic Landscapes* (the former Department of Environmental Regulation, 2015) provides guidance on works that require further investigation.

v. Construction dewatering is required to be undertaken consistent with *National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in high groundwater environments* (Water Quality Australia, 2018).

vi. Management of land uses that have the potential to impact on water quality in accordance with sections 6.3.2, 6.3.3 and 6.3.4.

6.3.1 Specific land uses and water quality

A wide range of land uses have the potential to impact on water quality through the export of nutrient (primarily phosphorus and nitrogen) and all other contaminants. A list of land uses and associated contaminants is provided in *Assessment and Management of Contaminated Sites – Appendix B* (DWER, 2021). Further guidance on other land uses with the potential to impact on water quality as a result of high nutrient export risk are detailed in section 6.3.3 and provided in DWER Water Quality Protection Notes.

The assessment of planning proposals with the potential to impact water quality should have due regard to the advice and recommendation of the EPA and/or DWER and not duplicate the roles of these agencies in the implementation of Part IV and V of the *Environmental Protection Act 1986*.

i. Where environmental impacts may be significant, local government is required to refer proposals to the EPA under Part IV of the *Environmental Protection Act 1986*. A proponent may also elect to refer a proposal to the EPA.

ii. DWER regulates industrial emissions and discharges from prescribed premises to the environment through a works approval and licensing process, under Part V of the *Environmental Protection Act 1986*. 'Prescribed premises' are industrial premises with potential to cause emissions and discharges to air, land or water. They are listed in Schedule 1 of the *Environmental Protection Regulations 1987*.

iii. Where proposals are not referred to the EPA under s48A or s38 of the *Environmental Protection Act 1986*, DWER can assess an application for prescribed premises concurrently with applications for planning approval. It is common for DWER to defer formal determination until after the relevant planning decision has been made. However, this can vary under certain circumstances. *Industry Regulation Guide to Licensing* (DWER, 2019) outlines DWER's implementation approach to Part V of the *Environmental Protection Act 1986* where planning approval is required.

6.3.2 Locating high nutrient land uses

Proposals should be on land where nutrient export to sensitive water resources can be effectively managed.

The following land uses are associated with high nutrient export:

i. *Agriculture intensive: particularly annual horticulture.* The land use 'Agriculture – intensive' encompasses a wide variety of agricultural pursuits and the associated nutrient requirements vary significantly. Annual horticulture has particularly high phosphorus inputs. Annual horticulture involves the production of plants with short-term life cycles (typically completed within the period of one year). Crops include annual fruits (strawberries, melons, etc.), vegetables (for example, potatoes, lettuce, cabbages, tomatoes, pumpkins), commercial turf production and cut flowers.

    Some land uses included within the definition of Agriculture – intensive such as the production of native flowers have low nutrient inputs and are unlikely to have a detrimental impact on sensitive water resources, regardless of location. This includes some forms of aquaculture, as well as the production of native plants or other crops with low nutrient requirements.

ii. *Animal husbandry – intensive.*

iii. *Animal establishments or rural pursuits* involving stocking rates that exceed recommended stocking rates. These rates are prescribed in *Stocking Rate Guidelines for Rural Small Holdings, Swan Coastal Plain and Darling Scarp and Surrounds, Western Australia* (DPIRD (Van Gool, D; Angell, K; and Strange, L), 2000). In areas where these guidelines do not apply, contact DPIRD for recommended rates.

Land where nutrient export to sensitive water resources can be effectively managed is generally:

1. located outside sensitive water resource areas;
2. characterised by site and soil conditions that are favourable to the retention of nutrients:
    a) This can be identified at a regional scale by DPIRD soil-landscape and land capability mapping in conjunction with advice from DPIRD and DWER. The land uses identified above may not be suitable for land identified on these maps with greater than 50 per cent: high to extreme phosphorus export hazard or very low to low land capability for the intended land use. Site-specific soil and land capability assessment, including testing of soils for phosphorus buffering is recommended when DPIRD's mapping is not available at the required scale or accuracy.
    b) This excludes land with high groundwater, a high density of artificial drains or frequent flooding; or
3. where it can be demonstrated that the proposal will not contribute to an increase in nutrient levels in surface or groundwater to the satisfaction of local government (in consultation with DPIRD and DWER). For example, this may involve demonstration that nutrient inputs will be low or that closed agricultural systems will be used.

SPP 2.9 states that flexibility to the siting of land uses should be applied to priority agricultural land. *State Planning Policy 2.5 Rural Planning* identifies priority agriculture land as:

> *"land of state, regional or local significance for food production purposed due to its comparative advantage in terms of soils, climate, water (rain or irrigation) and access to services. Priority agricultural land is derived from High Quality Agriculture Land data that has been subject to consultation and refinement, and has removed land required for existing and future urban/development areas, public use areas and land required for environmental purposes."*

It is acknowledged that intensive agriculture and animal premises are important contributors to the food security and economy of Western Australia. Priority agricultural land is preserved for the purpose of maintaining important agricultural activities. Processes to designate priority agricultural land should consider the potential impact on water resources of nutrient intensive land uses.

6.3.3 Management of water quality

Where a development application involves a land use with the potential to impact water quality, local government may consider the likely effect of the development on water resources and means proposed to mitigate impacts in accordance with the *Planning and Development (Local Planning Schemes) Regulations 2015 (clause 67)*.
A detailed WMR as described in section 5.1 will not necessarily be required and the planning assessment should not duplicate the assessment of water quality impacts required under separate legislation.

Where impacts to water quality are predicted, management should be put in place to reduce the impact to an acceptable level. If this is not possible, an alternative site should be chosen. Proposals should demonstrate that infrastructure and site management practices are in place to manage elevated levels of nutrients and/or contaminants, particularly within sensitive water resource areas.

Where a proposal involves irrigation with nutrient rich wastewater or fertigation, local government may require a nutrient and irrigation management plan to be prepared to ensure nutrients and water is used effectively while export to receiving waters is minimised. Refer to DWER's *Water Quality Protection Note 33: Nutrient and Irrigation Management Plans* (WQPN33) and WQPN 22: *Irrigation with nutrient-rich wastewater* for further guidance.

In all other instances, the following information can be used as a guide to demonstrate that elevated levels of nutrients and contaminants will be effectively managed. For simple proposals, this may be provided through an annotated site plan.

For more complex or higher risk proposals, more detailed information may be required:

1. Identify nutrient inputs and/or other contaminants in accordance with *Assessment and management of contaminated sites – Contaminated sites guidelines* (DWER, 2014).
2. Identify receiving water resources, including sensitive water resource areas (refer to section. 6.2) and any other water resource down-gradient from the site.

3. Show potential drainage of nutrients and/or other contaminants to water resources.
    a) Where the proposal is located on urban and industrial land, this may simply involve showing the location of soakwells and/or municipal stormwater infrastructure.
    b) Where the proposal involves high nutrient inputs, this may involve topography (indicating direction of water movement across the site), soil type, and groundwater gradient – particularly for sandy soils.
4. Demonstrate how potential impacts on water quality will be managed.
    a) For commercial or industrial land uses, this may involve appropriate wastewater disposal systems and bunding/containment areas.
    b) Where the proposal involves high nutrient inputs, this may involve:
        i. establishment of vegetated waterway foreshores and wetland buffers and additional separation distances required to protect water quality in waterways and wetlands from pollutants (refer to section 6.1). It is noted that vegetated buffers do not effectively reduce phosphorus export, particularly in soils with low phosphorus retention. However, they can contribute to the improvement of other water quality parameters;
        ii. soil amendment to improve on-site nutrient retention;
        iii. compliance with relevant industry code of practices and DWER guidance documents; and/or
        iv. the use of closed agricultural systems is encouraged in sensitive water resource areas.

Proposals for closed agricultural systems should clearly state containment methods and methods for removal and disposal of liquid and solid waste offsite.

6.3.4 Strategic planning for primary production and processing precincts, animal premises and intensive agriculture

State Planning Policy 2.5 Rural Planning Guidelines outlines matters to be considered when planning for priority agricultural land and primary production and processing precincts. This includes relevant environmental matters and land required for environmental conservation. This should be informed by the identification of:

i. sensitive water resource areas and receiving waters;
ii. potential impact on water resources; and
iii. planning control required to manage potential impact on water resources.

Where it is not practicable to locate these land uses away from sensitive water resource areas, measures should be in place to reduce nutrient export in consultation with referral agencies. For example, the WMR may include:

1. limiting precinct area to locations with better soils, particularly when located on the Swan Coastal Plain;
2. using soil amendments or infrastructure to capture and treat contaminants;
3. restoration, protection and management of waterway foreshore reserves and wetland buffers;
4. implementing best practice measures;
5. siting land uses away from water resources or flood prone land where nutrients can be easily mobilised and transported to water resources; and
6. protection, maintenance or increase in coverage of deep-rooted perennial vegetation.

6.3.5 Considerations for local government

Local planning schemes and local planning policies should include site-specific measures where relevant to manage the potential impacts on water quality, particularly within sensitive water resource areas. This may include:

i. identification of specific land uses with high nutrient export risk and defined in accordance with section 6.3.2-6.3.4;
ii. requirements for development applications with the potential to impact on water quality to demonstrate that appropriate design, infrastructure and management regimes can manage water quality risks;
iii. facilitation of closed agricultural systems;
iv. other site-specific measures such as controls on the siting and management of equine precincts, limiting stocking rates and the requirement for livestock management plans;
v. implementation of water sensitive design principles; and
vi. enhancement, protection and management of waterway foreshore reserves and wetland buffers.

6.4 Aboriginal and historic heritage

Proposals and WMRs are to consider Aboriginal heritage and historic heritage as follows.

6.4.1 Aboriginal heritage

Water resources are of ongoing cultural significance to Aboriginal people, this includes waterways and their foreshores, wetlands, waterholes, springs, rivers, creeks, streams and swamps.

The following information can be used as a guide to identify Aboriginal heritage and ensure it is effectively managed. Where relevant, this information should be captured in a WMR.

i. The Aboriginal Cultural Heritage Inquiry System lists the location of Aboriginal heritage reported to DPLH. This includes both 'registered sites' and 'lodged places'

ii. *Aboriginal Heritage Act 1972 Guidelines* November 2023

iii. *Consultation Policy for section 18 applications* November 2023

iv. Proponents should seek advice from DPLH if they are uncertain how a proposal may impact on Aboriginal heritage, using the ACHknowledge portal https://achknowledge.dplh.wa.gov.au/.

6.4.2 Other historic heritage

Consideration of other historic heritage in accordance with *State Planning Policy 3.5 Historic Heritage Conservation* may be required. This includes consideration of the:

i. World Heritage List;

ii. National Heritage List;

iii. State Register of Heritage Places; and

iv. relevant local governments' Local Heritage Survey and Heritage List.

7 RIVERINE FLOODING

Floods are a natural phenomenon that occur when water covers land that is usually dry, and can vary in size, frequency and impact. A changing climate is expected to alter the frequency and scale of flooding and its associated impacts. Planning and development needs to anticipate, respond to and manage these impacts.

In flood prone areas, understanding the development capability of the land in relation to the full range of flood risk leads to more sustainable floodplain development and improved resilience of future development.

This section addresses riverine flooding and the measures provided in section 7.3 of SPP 2.9. Coastal storm surge and other inundation associated with water bodies dominated by tidal processes is to be addressed in accordance with *State Planning Policy 2.6: State Coastal Planning*.
In estuaries and tidal reaches of rivers, the effects of predicted sea level rise and storm surge should be considered in conjunction with riverine flood modelling and mapping to determine the appropriate design response to combined impacts.

Flooding can also occur when a rainfall event creates a flood independent of an overflowing water body, known as pluvial flooding. It can occur in urban and rural water systems and can be exacerbated by design issues, capacity constraints or blockage. There are two common types of pluvial flooding:

i. Surface water floods, which occur when an urban drainage system is overwhelmed and water flows into streets and nearby structures; and

ii. Flash floods, which are characterised by an intense, high-velocity torrent of water triggered by torrential rainfall.

Pluvial flooding should be considered as part of the management of stormwater, as outlined in section 8.4 of the Guidelines, and consistent with the *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022), the *Decision Process for Stormwater Management in Western Australia* (DWER, 2017), *Australian Rainfall and Runoff* (Commonwealth of Australia (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I), 2019) and *Local Government Guidelines for Subdivisional Development* (IPWEA, 2017).

7.1 Identifying flood prone land

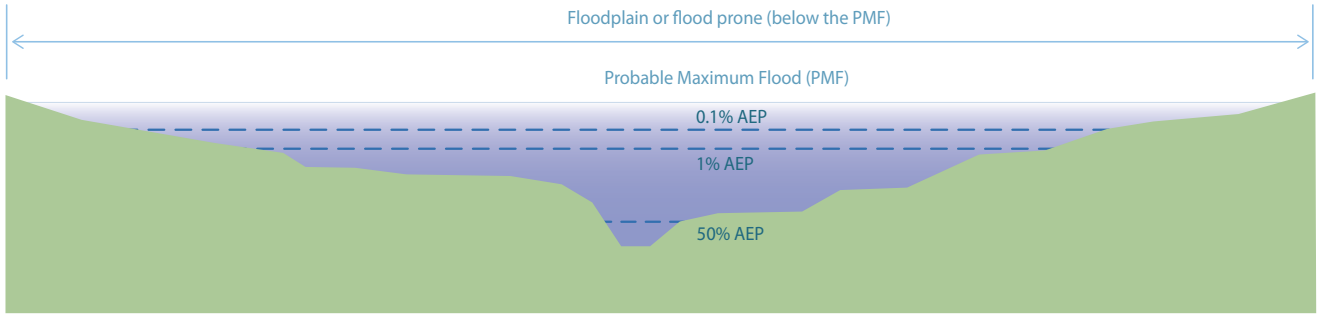
DWER's floodplain mapping identifies areas with flood risk. Flood studies are a scientific investigation of flooding using computer modelling, field data and information from past flood events to understand flood behaviour and prepare floodplain maps.

In most cases, the defined flood event represents the one in 100 (one per cent) AEP flood event. The one per cent AEP flood has a one per cent chance of being exceeded in any given year. In locations where insufficient information is available to adequately estimate the one per cent AEP flood, an observed flood event (such as the floods at Moora in 1999, Warmun in 2011 and Blackwood River in 1982) may be used as the defined flood event. Floods larger than this can occur but with a reduced probability.

The probable maximum flood is the largest flood event that could possibly occur at a particular location.
The extent of the probable maximum flood defines the largest area deemed to be inundated by floods and generally defines the floodplain. These terms are illustrated in Figure 6 below.

A floodplain development strategy or floodplain management study outlines options for managing flood risk to current and future development. These studies

Figure 6: Flood events terminology



may further define the floodplain into floodway and flood fringe zones (refer to SPP 2.9 Definitions and Figure 7), each with a different set of development considerations.

When defining floodway and flood fringe areas consideration is given to:

i. flood behaviour (including risk, hazard and likely effects of future development);

ii. potential access and isolation issues;

iii. local planning needs;

iv. environmental issues, including identifying and protecting waterway foreshore areas and wetland buffers (refer to section 6.1); and

v. social factors (such as recreation and heritage).

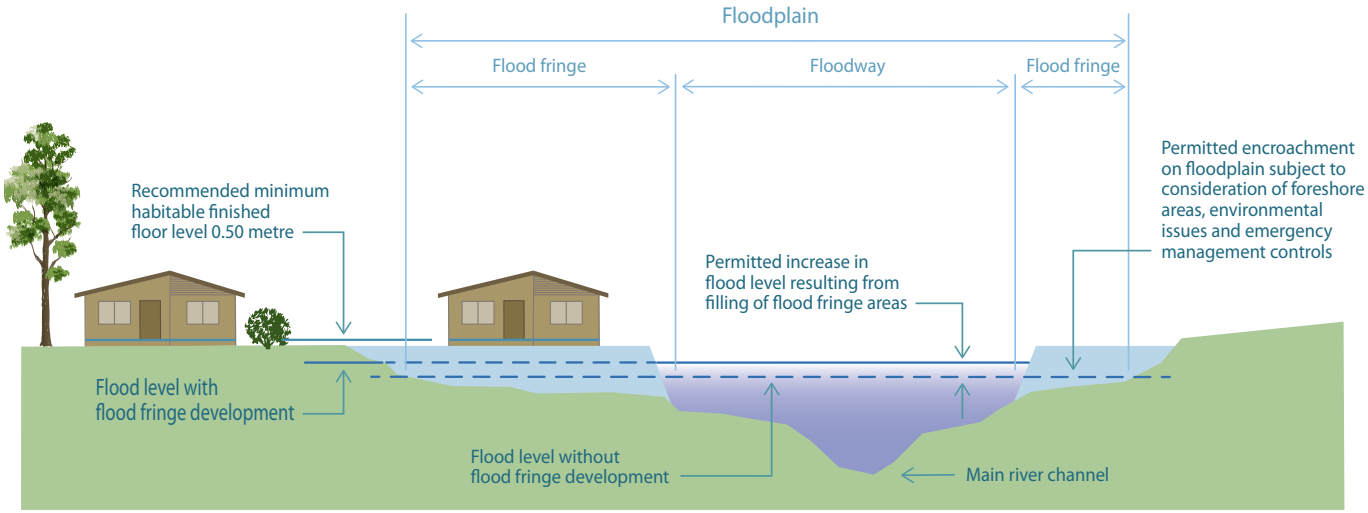
Where no flood mapping exists, advice should be sought from DWER and further modelling and local flood studies may be required.

7.2 Identifying flood information in local planning instruments

The adoption of a risk management approach enables planning and investment to be focused on understanding and managing flood risk. DWER has completed floodplain mapping for many key waterways in Western Australia. This spatial information is available to view and download from DWER's website and should be reflected in local planning schemes (for example, as special control areas) or in local planning policy mapping where appropriate.

Additional provisions: land use, subdivision and development within this special control area are to comply with all the measures set out in SPP 2.9.

Figure 7: Flood criteria and terminology



Suggested wording for "Flood Prone Land" special control area objectives is as follows:

Purpose: To mitigate the potential risk to people and flood damage resulting from decisions relating to land use and development on defined floodplains.

Objectives:

1. to identify land within the Scheme area at risk of being affected by flooding;
2. to assist in the protection of life, property and community infrastructure from flood hazard;
3. to assist the natural flood-carrying capacity of floodplains by ensuring any use or development maintains the free passage and temporary storage of flood waters; and
4. to protect water quality and waterways as natural resources in accordance with *State Planning Policy 2.9 Water*.

7.3 Planning and development in flood prone land

Planning and development proposed within a floodplain, or on flood prone land likely to be impacted by flooding where no floodplain, flood fringe or floodway has been defined, will require assessment by DWER. The WMR is to include, but is not limited to, a local flood study or flood risk assessment to demonstrate no impact on surrounding areas, including cumulative considerations of current, future and residual flood risk. The WMR should demonstrate acceptable vertical separation (that is, minimum habitable finished floor level as per SPP 2.9), safe access and evacuation procedures and provision of an adequate waterway foreshore area.

There is a presumption against the intensification of development within a defined floodway through rezoning, subdivision or development. It is recommended that any defined floodway is included within an appropriate foreshore reserve and ceded to State or local government free of charge as part of a planning process (rezoning or subdivision). The process of identifying a foreshore reserve is based on various considerations as outlined in section 6.1. The foreshore reserve may be greater than the defined floodway.

Proposals on land located in the flood fringe (or floodplain where no flood fringe is defined) may be acceptable subject to achieving a minimum habitable finished floor level of 0.5 m above the expected one per cent AEP flood event, and appropriate emergency management controls. In flood fringe areas, the cumulative impact of development has already been considered, and no additional assessment of afflux resulting from a proposal is required. However, appropriate vertical separation, safe access and evacuation procedures and provision of an adequate waterway foreshore area should be demonstrated.

If development in the floodplain is unavoidable, for the proposal to be deemed acceptable, the WMR should demonstrate the following:

i. modelling of the cumulative impact of any proposed development or fill on upstream and downstream areas;

ii. earthworks design to provide acceptable vertical separations without detrimental impact on the amenity of the waterway and foreshore;

iii. staging plan to manage changed flood regimes during interim stages;

iv. design of a road network to provide access and egress routes that are safe for use during floods consistent with the latest State and National guidance (such as the *Australian Disaster Resilience Guideline 7-3 Flood Hazard* (The Australian Institute of Disaster Resilience, 2017));

v. provision of an adequate waterway foreshore reserve; and

vi. Ecological function and processes are maintained.

Maintaining the function of the floodplain is essential to ensure it can perform its natural functions of flow conveyance and storage. Therefore, no structures will be approved for construction within a defined floodway where they are considered to constitute an obstruction during flooding.

Exceptions may be provided on advice of DWER where:

1. the proposal is for a land use considered by the decision-maker to not introduce unacceptable risk to people, property or infrastructure and will maintain the free passage and temporary storage of floodwaters. These land use proposals should be considered on a case-by-case basis;

2. existing structures are to be replaced with the same or lesser width of obstruction and the proposal can achieve acceptable vertical separation;

3. critical community facilities are required and can demonstrate acceptable management of impact; or

4. the proposal is for a boundary realignment and use of land where there is no increase in development.

Consideration should be given to the potential impacts of future changes in climate on flood behaviour, the risk to the community and the adaptability of management measures to the change. The impacts of changes to rainfall and mean sea level rise (on inland flood levels) should be considered separately to understand the drivers of change, and in combination to assess the potential cumulative impacts.

Vulnerable and essential infrastructure, such as hospitals, schools, emergency response buildings, evacuation centres, essential services (for example, power and water) and aged care facilities should be located outside of known flood prone areas where possible. Alternatively, the proposal should provide for a higher level of flood protection (for example, consideration of evacuation routes and procedures) to ensure assistance can be provided in a flooding event.

Where a published and DWER-endorsed floodplain management strategy or other water management document is available, guidance for the appropriate response to flood risk will be provided in the document and should be identified in the relevant WMR.

7.3.1 Notification on title in flood prone areas

Notifications on title may be required as a condition of approval for lots of subdivision and development proposals located within the floodway, flood fringe or flood plain. Notifications on title advise prospective purchasers of the potential for flood hazards and help with managing expectations. The recommended condition (including the notification itself) is provided in the Model Subdivision Conditions Schedule.

For development approvals, local governments should use section 70A of the *Transfer of Land Act 1893*. Proponents are strongly encouraged to make prospective purchasers aware of the existence of the notifications on title on affected lots, such as through contracts of sale. Prospective purchasers of land/lots/dwellings located within the area to which the policy applies may wish to contact the relevant local government for further advice.

8 INFRASTRUCTURE AND SUPPLY

8.1 Water demand

The continued growth of Western Australia's population and economy means demand for water is increasing. As a result, strategies for the sustainable, efficient and optimal use of water resources are encouraged to ensure access to climate-resilient water supplies for domestic consumption, household and public open space irrigation, recreational facilities, agricultural and industrial purposes. Optimising the use of sustainable groundwater and surface water through efficiency measures and trading water entitlements to higher-value uses can help to defer or avoid the cost of developing higher-cost alternative supplies. An understanding of likely impacts of climate change, particularly where groundwater and surface water availability is declining in the South West due to reducing rainfall, should be considered and, where applicable, reflected in the WMR.

Strategies to conserve and use water efficiently include:

i. efficient irrigation infrastructure and agricultural processes consistent with industry best practice;

ii. co-locating infrastructure (for example, co-locating school ovals and public parks, locating district playing fields close to potential water sources such as wastewater treatment plants);

iii. public open space planning to provide a mix of types and prioritise where water is used for maximum community benefit (for example, minimising water use on non-active open space while optimising water use on active playing fields and hydro zoning public open space, using sensor-based irrigation systems and the use of appropriate species to minimise irrigation and nutrient requirements);

iv. using alternative water sources (such as treated wastewater, stormwater, rainwater tanks and grey water); and

v. using metering systems to monitor and adaptively manage irrigation and water use.

8.2 Water supply and alternative water sources

Where it is not possible to connect to existing services or where additional water, supply infrastructure capacity is required, alternative servicing arrangements (using sources such as treated wastewater, grey water, stormwater and drainage water) may be proposed. The demand and availability of water for non-drinking water purposes needs to be assessed early in the planning process and in these cases, the WMR should provide a greater level of detail, including details of the arrangements and land areas required to provide for the new or modified infrastructure.

Non-drinking water supplies use a fit-for-purpose water source in lieu of public water supply scheme water. Non-drinking water supplies can have lower quality standards than drinking water, but are still suitable for many uses such as outdoor household irrigation, public open space irrigation, agriculture, industrial uses, firefighting, as well as in-house/domestic non-drinking water uses such as toilet flushing.

Where a development is proposed to be serviced by a non-drinking water supply and has a minimum volume to become operational, the WMR should provide details of interim arrangements, including as a minimum:

i. interim source options (partial or temporary);

ii. roles and responsibilities including both implementation and operational funding models;

iii. regulatory requirements and the timing of these to avoid delays; and

iv. triggers for when the partial or temporary solution needs to be upgraded or replaced.

The use of alternative water sources should be safe, fit-for-purpose, meet regulatory, public health and environmental standards, and reflect community expectations. The *Guideline for Approval of Non-Drinking Water Systems* (DoW, 2013) describes four stages to plan and establish a non-drinking water system in urban developments and provides the general consideration and specific approval requirements. The timing for completing these studies, identified in the guideline document, will depend on the scale and complexity of the water supply issue, and whether there is an agreed lead water service provider.

In assessing and securing optimal, sustainable and fit-for-purpose water supply, consultation with the relevant service provider(s), State and local government is required to gain their in-principle agreement to allow for connection to existing systems and/or a 'commitment to adopt' new infrastructure post-construction. The WMR should include a summary of this consultation, including confirmation that connection to all necessary services is both possible and feasible.

Where the availability of groundwater and surface water is limited, investigations should be undertaken at the district planning stage to determine the feasibility and optimal scale of alternative non-drinking water supply options.

For lots less than one hectare, connection to reticulated water supply will generally be required. For lots larger than one hectare, refer to *State Planning Policy 2.5 Rural Planning* for guidance on the servicing for rural living lots.

8.3 Dams, crossings and rural drains

Dams, crossings and rural drains should maintain the natural flow and ecology of waterways and wetlands allowing for the passage of aquatic fauna. This will minimise the risk of fragmenting aquatic fauna populations, restricting migration to breeding grounds, limiting available habitat or causing the local extinction of aquatic fauna.

Where a dam, crossing or rural drain proposal is situated on land within a surface water area, river or irrigation district proclaimed under the *Rights in Water and Irrigation Act 1914*, a licence/permit from DWER is required, as well as development approval (if required) from the relevant local government authority. Further information on rural dam construction and operation, licensing, permitting, legal responsibilities, design, construction, operation and minimising harm to watercourses and aquatic fauna is provided in:

i. *Supplementary Information for Permit Applications to Interfere with Bed or Banks of Watercourses* (DoW, 2012)[8];

ii. *WQPN 53 Dam Construction and Operation in Rural Areas* (DWER, 2019);

iii. *Water Note 26: Simple Fishways* (Water and Rivers Commission, 2002);

iv. *Building Creek Crossings* (DoW, 2010); and

v. *Crossing Creeks: Stream Crossings on Farms* (DoW, 2008).

Where a proposed dam (or modification to a dam, or other flow control structure) has the potential to result in a detrimental impact on the environment, the proposal should be referred to the EPA for consideration under Part IV of the *Environmental Protection Act 1986*.

Local Planning Schemes and policies can include development exemptions and development requirements that are appropriate for the local context.

Drainage and pumping for the purpose of controlling salinity is regulated under the *Soil and Land Conservation Act 1945*. These regulations require landholders intending to drain or pump water from under the land surface and then discharge that water onto other land, into other water or into a watercourse, to notify the Commissioner of Soil and Land Conservation via a *Notice of Intent to Drain*. Notification allows for the proposed works to be assessed by the Commissioner. It does not allow the Commissioner to object to issues not covered by the Act including general planning and development issues such as the impact on public infrastructure (roads) or visual amenity. Refer to DPIRD for further information on rural drainage to control salinity.

[8] This guide was prepared for surface water areas, rivers and irrigation districts proclaimed under the *Rights in Water and Irrigation Act 1914*, however the advice is relevant for all watercourses.

8.3.1 Local planning schemes and local planning policies

SPP 2.9 states that local planning schemes or/and local planning policies should outline development requirements for dams, crossings and rural drains in response to local conditions, where relevant. This may include the assessment and application of approval conditions, related to:

i. consideration of upstream or downstream impacts;
ii. design to ensure environmental flows are maintained;
iii. vegetation clearing and revegetation requirements;
iv. scale and purpose;
v. topography;
vi. setbacks from property boundaries or environmental features;
vii. visual impact;
viii. spoil disposal;
ix. design for fauna movement/passage;
x. discouraging dams on watercourses where there are viable off-stream alternatives;
xi. reducing watercourse crossings to a minimum and consolidating crossings with other infrastructure, where practicable;
xii. mitigating the risks or impacts from site disturbance, including erosion, sedimentation, weed introduction, vegetation clearing, loss of habitat and changes to ecological values;
xiii. construction standards and maintenance;
xiv. consultation with agencies, including DWER, DBCA and DPIRD (where relevant);
xv. engineering assessments or surveys, and/or any other locally relevant issues that may be applicable; and
xvi. maintenance, safety or potential liability issues, including rural drains when they extend beyond the property boundary.

If there are no other water resource matters relevant to the proposal, dams and crossings are not likely to require a WMR, however, they will need to minimise impacts to the environment and the downstream environment and other water users.

8.3.2 Exemption from development approval

SPP 2.9 states that local planning schemes and/or local planning policies should specify instances where the construction of dams, crossings and rural drains are exempt from development approval. The construction of dams, crossings and rural drains and associated clearing/site works constitutes development under the *Planning and Development Act 2005*. As such, development approval may be required, unless exemption is provided through the provisions of the local planning scheme and/or local planning policy.

The local government should identify exemptions in response to local conditions. For example, it may provide exemption for dams, crossings and rural drains in rural zones except where they:

i. are likely to have an impact on downstream users of groundwater or surface water;
ii. may have an off-site impact on another landowner;
iii. may affect/undermine public infrastructure such as roads; or
iv. involve drains that extend beyond the property boundary, which may result in maintenance, safety or liability issues for local government.

8.4 Stormwater management

Stormwater management systems should be designed in consultation with DWER and the relevant local government and be consistent with the *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022), *Australian Rainfall and Runoff* (Commonwealth of Australia (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I) 2019), *Australian Run-off Quality: A guide to water sensitive urban design* (Institution of Engineers Australia, Melbourne Victoria, 2006) and *Local Government Guidelines for Subdivisional Development* (IPWEA, 2017). Design objectives for stormwater management are provided in the *Decision Process for Stormwater Management in Western Australia* (DWER, 2017) and, where available, relevant drainage and water management plans produced by DWER.

Stormwater management systems should:

i. mimic natural hydrological processes;
ii. prevent and reduce pollution (including sediment) through the application of non-structural and structural controls and the management of runoff from small rainfall events;
iii. minimise the effective imperviousness of a development area and use overland flow paths to reduce changes to pre-development hydrology and reduce the transport of pollutants to receiving water bodies;

iv. be integrated within the built form (such as within road reserves, public spaces and public open spaces) to enhance amenity;

v. retain and increase vegetation throughout the urban landscape such as on buildings, public open spaces, in carparks and in road reserves;

vi. be integrated early in the land and water planning process so that the necessary investigations are undertaken to inform decisions at each stage of land planning and ensure enough land is set aside for water management;

vii. be designed to respond to site constraints while reflecting the economic, social, cultural and environmental outcomes sought for the site;

viii. be designed to provide serviceability, amenity and road safety during minor rainfall events; and

ix. be designed to protect public and private infrastructure and buildings from localised flooding and inundation during major rainfall events.

8.5 High groundwater

The decision to manage groundwater to protect infrastructure and support development should be based on a detailed understanding of the pre-development groundwater regime and dependent ecosystems, the changes that may occur as a result of land use change, and an assessment of the risk this presents to the environment and proposed development. In areas of high groundwater (permanently or seasonally), management of risks from water-logged soils or groundwater inundation may need to be considered as part of development. Contact DWER for more information about site indicators that help to identify areas of high risk from waterlogged soils.

Consideration of these risks is particularly important in the design of public and private open spaces and proponents can respond to these risks by:

i. providing for functional open spaces and critical assets in areas not prone to inundation;

ii. creating landscape designs consistent with the natural environment;

iii. designing infrastructure and buildings to withstand wetting and drying cycles;

iv. filling and/or draining parts of the land required for functional open spaces and critical infrastructure;

v. broad-scale filling of the land; and/or

vi. broad-scale draining of the land provided that off-site impacts can be managed.

Broad-scale filling of sites to significantly elevate the ground level in response to high groundwater is not a preferred approach and should be carefully considered in the context of impacts to the development's ability to retain native vegetation and trees; and sustainability of basic raw materials extraction and transportation.

Similarly, broad-scale draining of the land is generally not preferred and it is critical to consider the potential impacts of groundwater drainage systems in the context of impacts to water quality, hydrology and the environment.

Proposals to install a groundwater management system should be consistent with *Water Resource Considerations when Controlling Groundwater Levels in Urban Development* (DoW, 2013) and clearly articulate the impact the proposed measures will have on the pre-development groundwater systems and the receiving environments.

Considerations for groundwater management include:

1. the location and level of protection required for sensitive water resource areas and other important environments;

2. changes to catchment hydrology resulting from land use change, for example, acid sulfate soils, rising groundwater levels from vegetation clearing or decreased abstraction;

3. historical land use impacts on water quality, for example, contaminated sites, nutrient/pesticide plumes;

4. water quality and treatment before reuse or discharge to a receiving environment;

5. geotechnical conditions, site topography and adjacent land uses; and

6. the potential for reuse as a water source for irrigation.

8.6 Catchment drainage planning

Catchment drainage planning is the process undertaken to understand the movement of water through a catchment and identify the spatial areas needed to manage catchment-scale flooding and drainage. This work will show how the existing pre-development catchment behaves and informs district stage planning to provide a coordinated approach to the spatial requirements for flood and drainage management while avoiding fragmented outcomes at subsequent planning stage(s).

Catchment drainage planning should consider the capacity of the drainage system to accept additional flows and runoff volumes and ensure flooding, stormwater and groundwater can be adequately managed.
Areas that require catchment drainage planning should

be determined in consultation with DWER and current and/ or proposed asset owner(s) based on the prevailing water characteristics of the area and the impact these will have on spatial requirements for multiple-use corridors, natural and/or piped drainage or living stream corridors, flood storage areas, wetlands and/or waterways in the district planning stage. DWER should be contacted for further information on the areas, responsibility and guidance relating to catchment drainage planning.

The successful implementation of a catchment drainage plan by multiple landowners and developers over extended timeframes is reliant on a suitable level of detail being provided in the District WMR to address these issues. A District WMR should respond to catchment drainage planning and include, as a minimum:

1. land areas required for minor and major rainfall event management and documentation of design principles, objectives and management strategies;
2. drainage invert levels, dimensions, peak flow rates and volume and top water levels at critical points in the system coinciding with relevant cadastral, land ownership or planning boundaries;
3. identification of land set aside for flood storage and flows;
4. definition of retention/detention/treatment requirements and allowable discharge rates for individual lots, development precincts and/or sub-catchments;
5. indicative waterway foreshore, wetland buffer areas and landscaping requirements, including consideration of public amenity, safety (lighting and visibility), maintenance requirements and bushfire management;
6. strategies addressing the identified opportunities and risks to water resources, the environments and urban form including:
   a) the management of high groundwater;
   b) addressing water quality risks, sensitive water resource areas and important environments; and
   c) provision of linkages between existing and future environmental and community assets, both through and beyond the development area;
7. a detailed staging and implementation plan, including staging of subsequent development proposals, processes for setting aside land for flood storage, funding arrangements, construction responsibilities and requirements, and management responsibilities and requirements.

Catchment drainage planning should be undertaken by or in collaboration with current and/or proposed asset owner(s) to ensure proposals are consistent with their management approach and capabilities.

8.6.1 Interim arrangements for catchment drainage systems

Where a future development is proposed to be connected to a catchment drainage system yet to be established, the WMR should provide details of interim arrangements including:

i. land required for interim drainage infrastructure;

ii. location of infrastructure outside the subject land and a description of how access will be secured;

iii. potential environmental issues and management;

iv. who will be responsible for establishing the catchment drainage system; and

v. modification of the interim arrangements when the catchment drainage system is established.

8.7 Wastewater

All proposals are to demonstrate that future development will be provided with appropriate wastewater services. In most instances, this will involve connection to reticulated sewerage.

In Western Australia, the provision of reticulated sewerage minimises health, environmental, social and economic risk to the community and supports the widest variety of land uses. The requirement to connect to reticulated sewerage was broadly established in 1981 and has been consistently supported by successive governments.

It is acknowledged that on-site wastewater disposal technologies have advanced considerably in recent decades. However there are still significant risks associated with their use and they are not considered an appropriate alternative to reticulated sewerage. They may be an acceptable method of servicing in a limited number of instances, such as low-density development outside PDWSAs and sensitive water resource areas where reticulated sewerage is not feasible.

8.7.1 Beneficial use and reuse of wastewater

SPP 2.9 states that proposals are encouraged to incorporate the beneficial use and reuse of water resources. This is an important component of integrated water resource management and response to increasing pressures on water resources. As wastewater can contain a wide range of pathogens and contaminants, proposals involving its use and reuse should comply with relevant health and environmental regulations. Further information can be found in *Guidelines for the Non-potable Uses of Recycled Water in Western Australia* (DoH, 2011).

8.7.2 Instances where reticulated sewerage is required

SPP 2.9 contains broad criteria for outlining instances where reticulated sewerage is required. The information below provides further guidance and should be used to support the assessment of relevant criteria in accordance with measures 7.4 i) and 7.4 j) of SPP 2.9.

1. Where reticulated sewerage is deemed reasonable by the decision-maker. Further guidance on the test of reasonableness is available within the *Model Conditions Schedule* (WAPC, 2024).

2. Where reticulated sewerage is required on planning grounds, which includes:
   a) where the provision of reticulated sewerage is required by a local planning scheme, or a strategy or plan endorsed by the WAPC;
   b) when any stage or part of any future or proposed subdivision or development is already connected to reticulated sewerage;
   c) where the decision-maker determines any future or proposed subdivision or development can be reasonably connected to reticulated sewerage;
   d) where the decision-maker determines the absence of reticulated sewerage will jeopardise future land uses provided for in:
      i. a proposed or approved local planning scheme or scheme amendment; or
      ii. a proposed or endorsed WAPC policy, strategy or plan; and/or
   e) where the decision-maker determines the absence of reticulated sewerage will prejudice, physically or financially, the ability to provide sewerage to the local area.

3. Where the decision-maker determines the absence of reticulated sewerage will pose an unacceptable risk to public health, the environment or water resources. This includes instances where:
   a) the site requirements for sewer systems contained within the Guidelines cannot be reasonably met;
   b) the impact of on-site wastewater disposal is deemed likely to have a detrimental impact on the water quality of a PDWSA, sensitive water resource areas or other water resources.

Where approval of any future or proposed application without connection to reticulated sewerage is likely to set a precedent for similar proposals in the local water catchment, the cumulative impact will be considered;

c) urban, industrial or commercial subdivision is proposed in Priority 3 PDWSA; and

d) where the proposed lots are smaller than lot sizes listed in Table 2 section 8.7.7.

4. Where land is subject to a rezoning proposal which could result in the creation of lots where no part of the lot is able to meet the site requirements in sections 8.7.8 and 8.7.9.

8.7.3 Reticulated sewerage – demonstration of serviceability

Where a proposal involves connection to a reticulated sewerage scheme yet to be established, the proponent should provide sufficient information to demonstrate that reticulated sewerage services can reasonably be provided to the land. The WMR should provide:

1. details of proposed reticulated sewerage scheme, including:
   a) method of treatment and disposal (technology and operation);
   b) land required for sewerage infrastructure and disposal;
   c) where infrastructure is located outside the subject land, describe how access will be secured;
   d) potential impact on nearby land and required separation distance;
   e) potential environmental issues and management; and
   f) financial cost.
2. details and timing for regulatory approvals.
3. identification of and proven commitment (where appropriate) from the water service provider. Reticulated sewerage should be provided in accordance with the terms of a licence issued by the Economic Regulation Authority, unless the sewerage service provider has an exemption for the reticulated sewerage service, which is granted by the Minister for Water under section 7 of the *Water Services Act 2012*. It is acknowledged that it may not be feasible to obtain a water services licence in the early stages of the planning process.

   To ensure reticulated sewerage services will be provided, local planning scheme provisions should include the requirement for future development to be connected to a reticulated sewerage scheme.

8.7.4 Reticulated sewerage - survey strata

Where a survey-strata scheme is to be connected to reticulated sewerage, arrangements are to be made at the time of subdivision to ensure that a separate sewer connection will be available to each lot. Either the plan of subdivision or accompanying servicing plan is to illustrate the indicative connections and pipes within the scheme that are intended for separate use or occupation. Depending on the nature of the proposal, this may include:

i. installation of connections and sewerage pipes within the strata scheme boundaries (preferably within the common property); and/or

ii. easements or caveats to secure corridors for the future installation of connections and pipes.

Information on the water and sewer details for survey-strata lots to be sought from the Department of Local Government, Industry Regulation and Safety.

8.7.5 On-site wastewater disposal

Where reticulated sewerage is not required in accordance with measure 7.4 i) of SPP 2.9, on-site wastewater disposal may be considered where the responsible authority is satisfied that:

1. each lot can accommodate on-site sewage disposal in accordance with AS/NZS *1547 On-Site Domestic Wastewater Management* (Standards Australia/New Zealand Standard, 2012) (AS/NZS 1547). This should generally be provided in the form of a Site and Soil Evaluation (SSE) (refer to section 8.7.6); and
2. the requirements (as outlined in sections 8.7.7 – 8.7.10) for on-site sewage disposal can be met. Information on compliance should be provided in the WMR or SSE report and may be in the form of a:
   a) checklist or statement against criteria, and/or
   b) site plans showing (where relevant):
      i. existing and proposed buildings, paved surfaces (including driveways, verandas and alfresco areas), private bores and soak wells. This is particularly relevant for infill subdivision where existing dwellings are to be retained;

ii. land application areas. For residential subdivision that provides for single houses, areas should be in accordance with Table F.3 of Appendix F. Where hydraulic loads can be estimated for non-residential subdivision/ development or built strata areas they should be calculated in accordance with Table F.2 of Appendix F;

iii. setbacks from water resources; and

iv. PDWSAs and protection zones and sensitive water resource areas.

8.7.6 Site and soil evaluations

An SSE should be submitted with most unsewered proposals and should be appended to a WMR, where a WMR is required, or as a stand-alone report when a WMR is not required. They may be required in support of the following proposals:

1. local planning scheme amendments and structure plans that involve on-site wastewater disposal.
2. subdivision applications that propose on-site wastewater disposal. An SSE should be provided before determination of the application if it has not been provided at the earlier stage of the planning process. Where the WAPC, after considering advice from referral agencies, is satisfied the proposal is low-risk and the proposed lots can accommodate on-site wastewater disposal but require further information to inform the location of building envelopes or types of systems required, an SSE may instead be required as a condition of subdivision.
3. development applications that propose on-site wastewater disposal and have the potential to impact on sensitive water resource areas, where the lot has major constraints or where it is not clear that the lot is large enough to accommodate the proposed infrastructure and land application area. An SSE should be provided before determination of the application.

Where required, an SSE should be prepared in accordance with AS/NZS 1547 and:

i. demonstrate the proposed lots can accommodate on-site wastewater disposal;

ii. identify soil category in accordance with AS/NZS 1547 procedure;

iii. identify separation from highest groundwater levels, including perched water table where relevant;

iv. identify separation distances from water resources;

v. identify flooding zones and areas subject to seasonal inundation; and

vi. identify the type of treatment and disposal system required and any other associated site works such as fill or drainage that may be required.

Proponents are also responsible for engaging with a suitably qualified professional to undertake an SSE related to on-site wastewater disposal when required. In accordance with AS/NZS 1547, the SSE should be signed off by a suitably qualified professional (such as a soil scientist) and to the satisfaction of the local government and DoH.

The scale and level of detail of the SSE should be matched against the health and environmental risks associated with the site and proposed development, and determined in consultation with referral agencies. For complex sites, more detailed information will be required. The information requirements will be reduced where health or environmental impacts are considered minimal. Templates for SSEs are available on the DoH website.

Where it is not evident separation distances from groundwater will be achieved, a hydrogeological assessment of the site under the wettest time of the year conditions may be required. This includes instances where there is no reliable information on groundwater levels or areas where the groundwater is known to be relatively high. Where there is reliable data from nearby groundwater monitoring bores or groundwater models, it may not be necessary to determine groundwater levels through additional bore holes or pits.

8.7.7 Site requirements: Lot size

Table 2: Minimum lot sizes for on-site wastewater disposal

Location/Land use	Minimum lot size	Notes
PDWSA in rural, rural residential/rural living zones	One to four hectares	Minimum lot size dependent on priority area (P1, P2, P3) and zone. Refer to *Water Quality Protection Note 25: Land Use Compatibility Tables for Public Drinking Water Source Areas* (DWER) for further guidance.
In sensitive water resource area	One hectare	Land in a sensitive water resource area already zoned for urban use, with a residential density coding of R2 to R12.5 under a local planning scheme or structure plan endorsed by the WAPC, may be subdivided in accordance with the existing density coding. Where R10 subdivision is proposed, it should be demonstrated the density coding was assigned with the understanding that reticulated sewerage would not be provided. Smaller lots in a sensitive water resource area may be considered for non-residential subdivision on a case-by-case basis where it can be demonstrated the proposal meets the minimum site requirements and the responsible authority, in consultation with relevant agencies, is satisfied the proposal is consistent with the objectives of SPP 2.9.
Outside PDWSA and sensitive water resource areas	2,000m^2	Does not apply to rock. For clay soils, secondary treatment systems will be required to achieve this lot size (refer to Table F.1 in Appendix F).
Outside PDWSA and sensitive water resource areas and: i. infill residential or commercial subdivision in existing urban areas; ii. residential and commercial subdivision in towns outside the Metropolitan and Peel Region Scheme areas without an established reticulated sewerage scheme; or iii. residential and commercial subdivision in towns outside the Metropolitan and Peel Region Scheme areas with existing sewerage schemes (as listed in Appendix F) where unsewered subdivision at the density proposed is specifically provided for through the provisions of the local planning scheme or a local structure plan endorsed by the WAPC.	1,000m^2	The average lot size is not to be less than 1,000m^2, with a minimum individual lot size of 950m^2. Does not apply to rock or soil category 6 (medium to heavy clay), where larger lot sizes are required. For soil categories 4 (clay loams) and 5 (light clays), secondary treatment systems will be required (refer to Table F.1 in Appendix F). For lots less than 2000m^2, an assessment of the best practicable servicing option may be required.
Survey-strata lot or strata lot for an approved grouped dwelling, commercial or industrial development (outside PDWSA)	Case-by-case assessment	The on-site system for strata title schemes should service each lot and should be owned and operated by a single person or entity contracted to provide the service, or the strata company for the strata title scheme. An acceptable maintenance program should be in place for the on-site wastewater system. Due regard to be given to impacts within sensitive water resource areas.

8.7.8 Site requirement: setbacks from water resources

An on-site wastewater system should not be located within:

1. a wellhead protection zone or on Crown land within a reservoir protection zone;
2. 100m of the high-water mark of a reservoir or 100m of any bore used for public drinking water supply where:
   a) a wellhead protection zone or reservoir protection zone has not been assigned; or
   b) where existing lots would be rendered undevelopable by the wellhead protection zone.
3. 30m of a private bore used for household/ drinking water purposes;
4. 100m of a waterway or significant wetland and not within a waterway foreshore area or wetland buffer. The separation distance should be measured outwards from the outer edge of riparian or wetland vegetation;
5. 100m of a drainage system that
   a) is located down-groundwater-gradient;
   b) discharges directly into a waterway or significant wetland without treatment; and
   c) intersects groundwater; or
6. any area subject to inundation and/or flooding in a 10 per cent AEP rainfall event.

Smaller setbacks from reservoirs or bores used for public drinking water supply will not be supported. In all other instances, there may be rare cases where smaller setbacks may be considered (for example, where the lot would be rendered undevelopable) and where the proponent demonstrates to the satisfaction of the responsible authority, in consultation with relevant advisory agencies, that the reduced setbacks will not have a detrimental impact on the environment or public health. In seeking a reduced setback, secondary treatment systems with nutrient removal may be required.

8.7.9 Site requirement: separation from groundwater

The discharge point of the on-site wastewater system should be at least the following distances above the highest groundwater level, taking into account long-term variability, possible groundwater rise following development soil type and perched water tables[9]:

1. PDWSA - 2m; and
2. all other areas -
   a) loams and clay soils - 0.6m
   b) gravels – 1m
   c) sands - 1.5m.

Where the use of fill is proposed to achieve separation distances, proponents may be required to provide additional information to demonstrate solutions are effective, do not impact on other lots through water diversion, are not cost prohibitive and will not compromise amenity or landscape values. Where a substantial amount of fill is required, conditions of subdivision may require fill to be provided before lots are created or a notification on title.

[9] A perched water table is groundwater that is trapped above an impermeable soil layer, such as clay or rock, and forms a lens of saturated material in the unsaturated zone.

The use of drains or fill to achieve separation distances will only be considered for land already zoned for more intense development and where a drainage management plan is provided to the satisfaction of the responsible authority in consideration of advice from referral agencies to demonstrate:

i. how separation from groundwater will be achieved;
ii. adequate separation between land application area and drains in accordance with section 8.7.8; and
iii. that re-directed water will not impact upon surrounding properties or receiving water bodies.

8.7.10 Site requirement: land application area

The land application area is the unencumbered area to which treated wastewater from an on-site wastewater system is distributed for further in-soil treatment and absorption or evaporation. Each lot should be of sufficient size to accommodate development and an unencumbered land application area. The land application area should:

1. be restricted to the distribution of treated wastewater;
2. be sized in accordance with Tables F.2 and F.3 in Appendix F;
3. be kept free of any temporary or permanent structures;
4. be designed so activities do not interfere with the function of the land application systems and avoid potential for human contact with effluent residues. Unless allowed for in the design, the land application area should:
    a) not be built on or paved in a manner that precludes reasonable access;
    b) not be subject to vehicular traffic (other than a pedestrian-controlled lawnmower);
    c) not be subject to regular foot traffic such as pathways and clothesline areas; and
    d) be kept in a manner that enables servicing and maintenance;
5. incorporate setbacks from lot boundaries, infrastructure and hardpan/bedrock as prescribed under the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* and associated codes of practice; and
6. where slope exceeds one in five (1:5), the land application area should be engineered to prevent run-off from the land application area. Surface contours should be provided on the site plan.

The location of land application areas outside building envelopes may be approved based on the recommendations of the SSE and advice from referral agencies where proposed location meets requirements outlined above.

8.7.11 Type of on-site treatment system required

All proposed on-site systems should be approved for use in Western Australia under the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* and certified in accordance with relevant standards for primary[10] and/or secondary treatment[11].

Where reticulated sewerage will not be provided, the type of on-site system required should be identified through the preparation and assessment of planning proposals to which SPP 2.9 applies.

The type of on-site wastewater system required should be determined in accordance with the recommendations of the SSE and advice from referral agencies.

Applications to construct or install an apparatus for the treatment of sewage in accordance with the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* may be informed by the information contained in this section. However, it is intended to be used as guidance and should not be applied with stringent regulatory effect.

Relevant considerations include:

i. Site and soil conditions.

ii. Potential impact on water resources. Within PDWSAs and sensitive water resource areas, secondary treatment systems with nutrient removal will generally be required, particularly where lots are less than one hectare in size or where soils have low capacity to retain nutrients. The systems should meet the criteria for nutrient removal in Table 2.2 of AS1546.3. Other solutions may be considered where high site-specific land capability for nutrient retention can be demonstrated and water resources will not adversely be impacted.

iii. Proposed land use. The on-site wastewater system should be designed to accommodate hydraulic loads (including seasonal variation) and composition of wastewater generated (including trade waste where applicable).

[10] **Primary treatment** involves the separation of suspended material from sewage in septic tanks, primary settling chambers, or other structures (including those that may be used to treat trade waste), before discharge to either a land application area or secondary treatment process. Primary treatment systems are certified under Australian/New Zealand Standard 1546.1:2008 On-site domestic wastewater treatment units – Septic tanks (ASNZS 1546.1:2008). Primary treatment systems include septic tanks with leach drains.

[11] **Secondary treatment** involves microbiological digestion and physical settling and filtering processes and decomposition of sewage constituents following primary treatment. **Secondary treatment** systems are certified in accordance with *Australian/New Zealand Standard 1546 2017 On-Site Domestic Wastewater Treatment Units Secondary treatment systems* (AS1546.3:2017).

iv. The availability of systems and maintenance personnel required to service secondary treatment systems in accordance with certification requirements. This is particularly important in rural and remote areas.

v. Secondary treatment systems should only be required in response to site constraints or to manage specific risks to public health, the environment or water resources.

8.7.12 Best practicable servicing option

Where a planning proposal includes provision for lots less than one hectare and reticulated sewerage is not available, an assessment may be required to determine the best practicable option for sewerage servicing.

Within PDWSAs, instances where reticulated sewerage connection will be required as the best practicable servicing option should be in accordance with *WQPN 25: Land Use Compatibility Tables for Public Drinking Water Source Areas* (DWER). In other instances, the assessment to determine the best practicable service option should include:

1. Wastewater treatment and disposal option costs, including but not limited to:
   a) connection to an existing sewerage scheme. Where the subject land is remote from the development front, consideration should be given to delaying development until services are available;
   b) development of a new reticulated scheme servicing a local area; or
   c) on-site treatment and disposal.
2. Land use planning impacts:
   a) identify if the lack of reticulated sewerage will restrict opportunities to intensify or change land uses in the future. This is particularly important where more intense land uses are provided for in a strategic plan prepared or endorsed by the WAPC, local planning strategy or local planning scheme;
   b) identify if the lack of reticulated sewerage will jeopardise the provision of sewerage infrastructure to nearby land; and
   c) for non-residential/industrial proposals, identify if land uses should be restricted based on volumes of wastewater (including trade waste) that are likely to be generated.
3. Public health and environmental impacts:
   a) identify potential impacts on sensitive water resource areas, marine reserves[12], karst systems or declared rare flora[13] or fauna habitats;
   b) for non-residential/industrial proposals, consider the type of land uses provided for and the contaminants likely to be present in trade waste;
   c) where on-site wastewater disposal is proposed, and approval is likely to set a precedent for similar unsewered subdivision in the local catchment, cumulative impacts should be considered;
   d) identify measures to reduce impacts; and
   e) where on-site wastewater disposal is considered, information from local government should be sought on the performance of on-site systems in the local area at the proposed density. The creation of lots less than 2000m^2 may not be supported where local government or referral agencies advise that on-site disposal in the local area has been problematic.
4. Administrative impacts:
   a) details of servicing/maintenance arrangements and mechanisms in place to support these arrangements; and
   b) details of regulatory requirements if a new reticulated scheme servicing a local area is proposed.

For localities that do not have an established reticulated sewerage scheme, detailed information should not be required unless the scale of settlement expansion may warrant the provision of a new reticulated sewerage scheme.

8.7.13 Trade waste management

Trade waste may contain a range of environmentally hazardous materials that should not be discharged to the environment (refer to the *Environmental Protection (Unauthorised Discharges) Regulations 2004* and *Environmental Protection (Controlled Waste) Regulations 2004*)'.

[12] Environment quality targets are outlined in management plans for Marine Parks and Reserves.

[13] On-site wastewater treatment systems have the potential to affect native flora species. Declared Rare Flora (DRF) are protected under the *Wildlife Conservation Act 1950* (WC Act 1950). The taking of DRF is prohibited unless an application is approved under the WC Act 1950. DBCA recommends proponents consider applying for a DRF permit if there is any activity within 50m of DRF that has the potential to impact upon the flora species.

Most reticulated sewerage schemes are not designed to accept trade waste, which could pose threats to public health and safety and to the environment. Discharge of trade waste to a reticulated sewerage scheme will be subject to strict acceptance criteria in accordance with the *Water Services Act 2012*. The sewerage service provider may require proponents to:

i. comply with an appropriate permitting scheme;

ii. provide a level of on-site treatment of trade waste before discharge to the reticulated sewerage scheme; and

iii. comply with other alternative arrangements as reasonably required by the sewerage provider.

If reticulated sewerage is not available or trade waste cannot be accepted by the sewerage service provider, alternative arrangements will need to be made.

Where it is known that the proposal will involve the on-site disposal of trade waste, additional information may be required to demonstrate appropriate infrastructure is incorporated into the development, ensuring environmentally hazardous material is not disposed of on-site or into stormwater drainage. This can be demonstrated in accordance with section 6.3.3 of the Guidelines. Where it is possible to estimate the quantity of trade waste to be disposed of on-site, site plans should include an appropriately sized land application area. Where relevant, on-site disposal of trade waste is to be managed in accordance with an industry regulation approval under Part V of the *Environmental Protection Act 1986*.

9 PUBLIC DRINKING WATER SOURCE AREAS

PDWSAs provide drinking water to communities around Western Australia. They are protected via constitution under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as underground water pollution control areas (UWPCAs), water reserves or catchment areas. There are approximately 140 PDWSAs servicing towns and cities across Western Australia. The requirements of this section apply to constituted PDWSAs. They may also be used for guidance within non-constituted drinking water source areas such as remote communities and mine sites.

9.1 Key concepts and assumptions

The following key concepts underpin the protection of PDWSAs:

1. The State is committed to implementing the *National Water Quality Management Strategy - Australian Drinking Water Guidelines* (National Health and Medical Research Council, 2011, updated 2018) (*Australian Drinking Water Guidelines*), which is the main reference for the protection, management and supply of safe drinking water to consumers.
2. Drinking water source protection should not be compromised. Safe, reliable, and good quality drinking water is critical to ongoing development in Western Australia and the health of its people.
3. PDWSAs are managed through a multiple barrier approach because no single barrier is effective against all conceivable sources of contamination.
4. Prevention is better than cure. For drinking water supplies, source protection is the single most effective mechanism to protect drinking water quality and public health.
5. Further development increases risks to drinking water quality and public health. This is an inevitable consequence of more chemical, biological and physical hazards being introduced due to more people, buildings, vehicles and rubbish associated with land use intensification. While it may be several years before contamination incidents occur or become evident, the consequences can be catastrophic and are generally irreversible.
6. Risks in PDWSAs are public health risks. Evaluation of risk associated with development in PDWSAs should incorporate a preventative approach in accordance with the *Australian Drinking Water Guidelines*. Risk assessments should include maximum and residual risk, the probability (likelihood) and consequence of contamination.
7. Drinking water quality and quantity are linked and should not be managed in isolation.
8. The precautionary principle should be applied, via a presumption against inappropriate development or land uses that pose an increased risk to PDWSAs.

9. Intergenerational equity and sustainable use: the present generation should ensure the health, diversity and productivity of our water sources are maintained or enhanced for the benefit of future generations.

9.2 Integrated water resource management and water source protection

Western Australia has an integrated land use and water resource management system that protects water quality and public health. This approach aims to ensure the provision of safe, good quality drinking water at a reasonable cost to consumers now and in the future. It ensures PDWSA protection is considered and implemented throughout the planning process.

A key component of the integrated approach is the identification of priority areas within PDWSAs. DWER identifies these via a drinking water source protection report for each PDWSA, available on DWER's website. The priority areas are as follows:

1. Priority 1 (P1) source protection areas are usually assigned over Crown land. They are managed in accordance with the principle of "risk avoidance" to ensure there is no degradation of the water resource. This is the highest level of protection for the water source and generally applies to land owned by the State characterized by low-intensity and low-risk land use, such as forestry. Protection of the public water supply outweighs virtually all other considerations in respect to the use of this land.
2. Priority 2 (P2) source protection areas are usually assigned over rural land. They are managed in accordance with the principle of "risk minimisation" to ensure there is no increased risk of pollution to the water source. P2 areas are declared over land where low-risk development already exists. Protection of public water supply sources is a high priority in these areas.
3. Priority 3 (P3) areas are usually assigned over urban land. They are managed in accordance with the principle of "risk management", which primarily involves some restriction on land uses with the potential to impact water quality. In these areas, supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments. If the water source does become contaminated, the water may need to be treated or an alternative water source found.
4. Priority 3* (P3*) areas are assigned over land that was previously P1 or P2 in the Metropolitan Region Scheme and was rezoned to 'urban'. P3* is a variation of the P3 management approach of risk management with additional restrictions on land uses with potential to impact on water quality.

In addition to priority areas, DWER assigns protection zones (wellhead protection zones and reservoir protection zones) to protect the water source from contamination in the immediate vicinity of drinking water abstraction points (that is, bores for groundwater sources and reservoirs for surface water sources).

Further information about DWER's management of PDWSAs is provided in *Strategic Policy: Protecting PDWSAs in Western Australia* (DWER, 2016) and WQPN 25 (DWER).

9.3 Region and local planning schemes

Section 7.5 of SPP 2.9 identifies how PDWSAs and their associated priority areas should be represented in region and local planning schemes. Scheme text accompanying special control areas should address the following:

1. The acceptability of subdivision and use classes within P 1, 2, 3 (and P3* if applicable) areas should be based upon WQPN 25 (DWER).
2. The advice of DWER and the relevant licensed water service providers (licensed by the Economic Regulation Authority under section 5 of the Water Services Act 2012) is to be sought and given due regard by the decision-maker before making a determination on:
   a) regional and sub-regional frameworks, region and local planning schemes and scheme amendments, planning strategies, precinct plans, activity centre plans and structure plans;
   b) subdivision applications inconsistent with WQPN 25 (DWER); and
   c) development applications involving a land use listed as 'incompatible', 'compatible with conditions', or not identified in WQPN 25 (DWER).
3. WMRs are to identify PDWSAs, priority areas, protection zones and drinking water abstraction points, and include measures to address or manage contamination risks to the drinking water source.
4. Where possible, proposals should maintain or increase native vegetation coverage to protect water quality.
5. Connection to reticulated sewerage where required in accordance with WQPN 25 (DWER) and section 8.7.

Suggested wording for a 'PDWSA' special control area is as follows:

Purpose: To identify and protect public drinking water source areas.

Objectives:

i) provide a basis for the protection of public drinking water resources through the control of land use or development, which has the potential to affect the quality of drinking water supplies for public use

ii) identify land designated as a public drinking water source area

iii) implement additional planning provisions designed to address water quality and public health risks in a public drinking water source area.

Additional provisions:

1. All development in the special control area requiring planning approval shall be subject to the local government's discretion, notwithstanding that the use may be permitted elsewhere in the scheme.
2. The local government shall refer all applications for planning approval to the DWER for comment where that application is for a use identified as 'compatible with conditions' or 'incompatible' in the relevant priority classification in WQPN 25 (DWER).
3. Notwithstanding the land use permissibility set out in Table One – Zoning Table, a use identified as incompatible within the relevant priority area in the Land Use Compatibility Table in WQPN 25 (DWER) shall not be approved, unless exceptional circumstances apply.
4. In determining or making recommendation on an application for planning approval or making recommendation on an application for subdivision in the special control area, the local government shall have due regard to:
    i. *SPP 2.9 Water* and associated guidelines;
    ii. advice received from DWER;
    iii. compliance with WQPN 25 (DWER);
    iv. recommendations of the relevant public drinking water source protection report or land use and water management strategy;
    v. the potential risk of contamination to the public drinking water source area resulting from a proposed land use and/or development;
    vi. the retention of native vegetation and protection of wetlands and waterways; and
    vii. the drainage characteristics of the land, including surface and groundwater flow, and the adequacy of proposed measures to meet water quality targets and manage run-off and drainage.
5. Development should be connected to reticulated sewerage, where required in accordance with WQPN 25 (DWER).

9.4 Considerations for proposals and decisions

The location of PDWSAs and their priority areas and protection zones are available on State and local government geographic information systems, the DWER website and the Australian Government's National Map.

Planning decisions on the acceptability of subdivision and specific land uses within PDWSAs should be based upon WQPN 25 (DWER). This document:

1. provides guidance on the permissibility of use classes within P 1, 2, 3 areas. In general:
    a) land uses described as 'incompatible' should not be permitted;
    b) land uses described as 'compatible with conditions' should not be permitted unless the decision-maker has exercised its discretion by granting planning approval, having due regard to advice from DWER and best management practices to protect the quality of the public drinking water source can be met. The application should also comply with other applicable development standards and requirements of the local planning scheme; and
    c) land uses described as 'acceptable' can be permitted providing they comply with the development standards and requirements of the local planning scheme.
2. provides reference to best management practices for different types of land uses and activities to ensure protection of water quality and public health when undertaking appropriate development within PDWSAs, which can inform conditions of planning approval.

3. provides detailed information on priority areas and protection zones, including how they are assigned and managed.

When located within a PDWSA, proposals and any relevant WMR should respond to the following considerations to address water quality risks:

i. Land uses and activities should be in accordance with WQPN 25 (DWER).

ii. Early and ongoing consultation with DWER, and where relevant the licensed water supply and wastewater service provider, should be undertaken during the development of all WMRs.

iii. Relevant recommendations of the drinking water source protection report or land use and water management strategy (available on DWER's website) should be incorporated into a WMR.

iv. Mapping should be provided that overlays proposed developments with the PDWSA boundary, priority areas and protection zones, and water off-take points (that is, reservoirs and abstraction bores).

v. A risk assessment of current versus proposed land use should be conducted in accordance with the preventive risk management framework advocated by the *Australian Drinking Water Guidelines*.

vi. The design and purpose of public open space should prioritise the retention of native vegetation. Incorporate protection zones into public open space where possible, preferably in public open space for conservation. Where the retention of native vegetation is not possible, design should minimise the need for irrigation, fertiliser and pesticides.

vii. Stormwater drainage should be directed away from drinking water abstraction points.

viii. Retain and rehabilitate existing vegetation to the maximum extent possible, particularly on the margins of water bodies and in protection zones.

ix. Infrastructure corridors (including road, rail, electricity, telecommunications, drainage, gas, sewerage, water conduits, and private infrastructure such as fuel and mineral slurry pipelines) should be located outside protection zones or as agreed with DWER.

x. Connection to reticulated sewerage is required for all urban and industrial subdivision in PDWSAs in accordance with WQPN 25 (DWER).

xi. Temporary pumping infrastructure should be located outside the PDWSA where possible. Where this is not possible, it is not to be located within a protection zone.

xii. Sewerage pump stations should be located outside PDWSAs and automated telemetry of sewerage levels should be in place to prevent overflows. Where this is not possible, sewerage pump stations are to be located outside protection zones and should be sized to service the smallest catchment area that is operationally practicable. They should be sized for the capacity and use of the development only (that is, not to service a larger catchment area extending beyond the development).

xiii. Site-responsive design should be used to direct surface and subsoil drainage away from drinking water extraction points such as via slopes and road cambers (curve upwards in the middle). Stormwater management infrastructure and/or subsoil drains should not discharge within protection zones. Where unavoidable, biofiltration is to be used.

xiv. Construction waste materials and litter should be collected daily and stored in weatherproof containers until removed offsite. Construction and development planning should include adequate contingency in the case of contamination incidences, in accordance with *WQPN 10 Contaminant Spills – Emergency Response Plans* (DWER, 2020).

xv. For large-scale urban subdivision, pre-development, construction and post-development, water quality monitoring programs should be consistent with *Australian Drinking Water Guidelines* and include monitoring for pathogens, nutrients and other contaminants, and a contingency action plan, with appropriate trigger values, responsibilities and reporting requirements.

9.5 Assessing land use intensification risk to drinking water resources

Measures contained in this section of the Guidelines are to be applied to high-level strategic plans and region scheme amendments. SPP 2.9 provides for a general presumption against the intensification of land uses in P1 and 2 areas, specifies limited instances where intensification may be considered and states that associated planning decisions should only be made with a detailed understanding of risks to the drinking water resource. The understanding of risk should be based on information provided by the referral agencies and the relevant licensed water service provider and address the following criteria:

i. strategic importance of drinking water source;

ii. nature of the water resource and its vulnerability to contamination;

iii. presence of acid sulfate soils that may be disturbed by the installation of subsurface infrastructure;

iv. risk assessment of existing vs. proposed land uses, in accordance with the *Australian Drinking Water Guidelines* preventive risk framework;

v. proximity to water supply bores/reservoirs;

vi. number and projected yield of bores/reservoirs potentially affected;

vii. potential costs associated with the relocation of infrastructure or substitution with other water sources;

viii. operational costs associated with managing increased risk of contamination, including monitoring and compliance operations and water treatment; and

ix. where intensification of a given area is likely to set a precedent for further intensification in the local area, the cumulative impact on the water resource should be considered.

10 PEEL-HARVEY COASTAL PLAIN CATCHMENT

The Peel-Harvey coastal plain catchment refers to the catchment of the Peel Inlet and Harvey Estuary that lies on the Swan Coastal Plain (refer to SPP 2.9 Policy mapping of Peel-Harvey Coastal Plain Catchment). The Peel Inlet and Harvey Estuary are part of the Peel-Yalgorup System, a wetland system with considerable environmental, economic, social, cultural and scientific values recognised for its international significance under the Ramsar Convention. A combination of land clearing, agricultural production and residential development has led to the progressive nutrient enrichment of the Peel-Harvey estuary and its waterways. This has resulted in the subsequent deterioration of water quality, habitat and ecological values across the catchment.

Land use planning decisions should be compatible with the achievement and maintenance of the objectives of the environmental quality objectives in the *Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992*, management goals and actions in the *Bindjareb Djilba – A plan for the protection of the Peel Harvey Estuary* (Government of Western Australia, 2020), the Ministerial Conditions imposed in *Bulletin 994 "Peel Region Scheme"* and the *Water Quality Improvement Plan for the Rivers and Estuary of the Peel Harvey System – Phosphorus Management* (EPA, 2008). They should also satisfy the requirements of relevant Peel Region Scheme and Greater Bunbury Region Scheme policies.

The *Water Quality Improvement Plan for the Rivers and Estuary of the Peel Harvey System – Phosphorus Management* (EPA, 2008) aims to improve water quality by reducing phosphorus discharges from the catchment through changes to agricultural and urban practices and land use planning. This plan identifies the status of phosphorus loads. It also identifies the values of water bodies and the water quality objectives that will protect these values, including management measures and control actions and can be used to inform relevant WMRs.

10.1 Considerations for proposals and decisions

Section 7.6 of SPP 2.9 contains a range of policy measures that apply to proposals within the Peel-Harvey coastal plain catchment. These measures should also be reflected in WMRs relating to land within the Peel Harvey coastal plain catchment. Further guidance on the implementation of these measures is outlined below.

1. Reduce nutrient export to the Peel-Harvey estuary system to be consistent with the water quality objectives contained in *Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992*. This may be achieved by:
    a) compliance with relevant regulatory and policy-based design criteria that have been developed to achieve the objectives, such as the *Peel Region Scheme Priority Agricultural and Rural Land Use Policy* or *Greater Bunbury Region Scheme Priority Agricultural Land Policy*;

b) stocking rates that are consistent with *Stocking Rate Guidelines for Rural Small Holdings, Swan Coastal Plain and Darling Scarp and Surrounds, Western Australia* (DPIRD (Van Gool, D; Angell, K; and Strange, L), 2000);

c) connection to a reticulated sewerage system in accordance with the requirements of the Peel Region Scheme and section 6.4 of SPP 2.9; and

d) management of irrigation and fertiliser use that reduces the export risk of nutrients to the estuary or other receiving waters.

2. Protect remnant vegetation and maintain or increase deep-rooted perennial vegetation coverage to improve water quality. The purpose of this measure is to mitigate the impact that land clearing and the intensification of land uses have had on water quality within the catchment. Actions to comply with this measure will depend on the nature of the proposal and include:

   a) minimising the clearing of remnant vegetation;

   b) rehabilitation of remnant vegetation; and

   c) establishment of deep-rooted perennial vegetation. Preferably this would be undertaken with endemic plant species, however exotic species may be supported where they will improve water quality outcomes.

3. Protect and revegetate waterways and drains with endemic plant species to improve the values to the Peel-Harvey estuarine system or engineer drains to reduce nutrient export.

   Waterways and, where appropriate, drains should be protected and revegetated to enhance the landscape, ecological and aquatic values of the Peel-Harvey estuarine system. This should include:

   a) the use of endemic plant species;

   b) the exclusion of livestock from waterways and drains to reduce soil erosion, and nutrient and organic matter inputs; and

   c) minimisation of stagnant water where possible to reduce mosquito breeding.

   Where a proposal involves the construction of a new drain or will impact an existing drain:

   i. The most appropriate approach to complying with this measure will depend on the form, function and location of the drain and should be informed by advice from DPIRD and DWER.

   ii. Drainage should be designed to maximise the retention of water on-site and reduce nutrient export. Direct drainage offsite will generally not be permitted without adequate nutrient reduction measures to the satisfaction of DWER.

   Rural drainage and pumping require a notice of intent to drain under the *Soil and Land Conservation Act 1945* (refer to section 8.3).

4. Manage nutrient export when they involve:

   a) *Agriculture – intensive*;

   b) *Animal husbandry – intensive*; or

   c) *Animal establishments or rural pursuits* involving stocking rates that exceed recommended stocking rates. These rates are prescribed in *Stocking Rate Guidelines for Rural Small Holdings, Swan Coastal Plain and Darling Scarp and Surrounds, Western Australia* (DPIRD (Van Gool, D; Angell, K; and Strange, L), 2000).

These land uses are associated with high nutrient inputs. The inappropriate siting and management of land uses with high nutrients have potential to significantly increase nutrient (particularly phosphorus) loads entering the Peel-Harvey estuarine system. As a result, there is a presumption against any further 'in-ground' intensive agricultural activities likely to pose significant risks to catchment water quality.

With regards to these land uses, there is a presumption against non-closed agricultural systems on sites with low or very low capability land for the intended land use or sites prone to nutrient export. Land capability and nutrient export hazard can be identified at a broad scale using DPIRD's *Soil and land capability for the Peel Harvey Coastal Plain Catchment* mapping, in conjunction with advice from DPIRD and DWER. Site-specific soil and land capability assessment, including testing of soils for phosphorus buffering is recommended when DPIRD's mapping is not available at the required scale or accuracy. Additional guidance for horticultural proposals is provided in the model local planning policy *Horticultural Developments in Local Government of the Peel-Harvey Coastal Plain Catchment* (Peel-Harvey Catchment Council, 2016).

The use of closed agricultural systems is encouraged to reduce the risk of nutrient export to the Peel Inlet and Harvey Estuary. Closed agricultural systems, which have zero or minimal discharge of nutrient-rich liquid or solids to the immediate environment, such as hydroponics or intensive livestock in sheds, are

preferred in the Peel-Harvey coastal plain catchment. Proposals for closed agricultural systems should clearly state containment methods and methods for removal and disposal of liquid and solid waste offsite. Where high-nutrient agricultural land uses are not closed agricultural systems and are sited appropriately, applicants should demonstrate nutrient export will be managed within acceptable levels and to the satisfaction of local government (in consultation with DPIRD and DWER). Refer to section 6.3.

10.2 Local planning schemes

As per measures 7.6 e) and 7.6 f) of SPP 2.9, local planning schemes should identify the Peel-Harvey coastal plain catchment in scheme maps and include specific provisions in scheme text to protect water resources.

It is recommended the schemes:

1. require decisions to be guided by the advice of DWER and DPIRD, and the environmental quality objectives as set out by the *Environmental Protection (Peel Inlet-Harvey Estuarine System) Policy 1992*;
2. require proposals to identify the Peel-Harvey coastal plain catchment and include measures to reduce nutrient export;
3. include measures to protect, maintain or increase deep-rooted perennial vegetation (including native) coverage to improve water quality;
4. prioritise the revegetation of waterways and drains with endemic plant species to provide buffering to the Peel-Yalgorup System and other wetlands;
5. require land uses to be sited in areas where nutrient export can be managed within acceptable levels;
6. provide a presumption against the following land uses in soils with low capability to retain nutrients as identified in the Phosphorus Export Hazard layer (Natural Resource Information Mapping):
   a) *agriculture – intensive:* in-ground annual horticulture;
   b) *animal husbandry – intensive:* poultry (free range), piggeries (free range and housed) and cattle feedlots; and
   c) *animal establishments or rural pursuits* involving stocking rates that exceed *Stocking Rate Guidelines for Rural Small Holdings, Swan Coastal Plain and Darling Scarp and Surrounds, Western Australia* (DPIRD (Van Gool, D; Angell, K; and Strange, L), 2000);
7. require proposals for '*agriculture – intensive*' and '*animal husbandry – intensive*' land uses to demonstrate that nutrient risk will be managed appropriately;
8. facilitate closed systems that do not result in nutrient export;
9. require connection to reticulated sewerage in accordance with the Peel Region Scheme and SPP 2.9; and
10. require development approval to keep horses, sheep, goats and other grazing animals in the rural residential, residential and special residential zones and for tourist development.

11 SWAN CANNING RIVER SYSTEM

The WAPC, Swan River Trust, DBCA and State and local governments are responsible for the effective planning and management of land use and development within, abutting and affecting the waters within the Swan Canning DCA, at all stages of the planning process.

The State Government has recognised the importance of the Swan Canning river system by legislating specifically for its planning, protection and management through the *Swan and Canning Rivers Management Act 2006*. The Swan Canning river system refers to the catchment area of the Swan, Canning, Helena, Southern and Avon (to Moondyne Brook) rivers (refer to the policy map *Swan Canning River System*).

The *Swan and Canning Rivers Management Act 2006* establishes the Swan Canning catchment area, the river reserve, the Riverpark and the DCA, and creates a governance, regulatory and approvals process to guide land use planning decision-making for the river system.

The DCA includes the waters of the Swan River (upstream of the Fremantle Port Authority boundary), Canning River (to its confluence with Stinton Creek), Helena River (to the lower diversion dam), Southern River (to the Allen Road crossing) and Avon River (to its confluence with Moondyne Brook), and adjoining parks and recreation reserves, as identified to the extent shown on the policy map of *Swan Canning River System*.

The *Swan Canning Rivers Management Act 2006* and the Metropolitan Region Scheme set the administrative decision-making process for development applications associated with the DCA. The location of the development application proposal in relation to the DCA determines the decision-making authority and the referral requirements as shown in Figure 8 and as follows:

i. Proposals that fall wholly within the DCA are determined by the Minister for the Environment on the advice of DBCA.

ii. Proposals partially within or abut the waters of the DCA are to be determined by the WAPC on the advice of DBCA (as a delegate for the Swan River Trust).

iii. Proposals on lots that abut land within the DCA or, in the opinion of the WAPC are likely to affect the waters of the DCA, are to be determined by the WAPC or the relevant local government (as a delegate of the WAPC) on the advice of DBCA (as a delegate for the Swan River Trust).

Proposals that may affect the waters of the DCA include, but are not limited to, developments that might mobilise sediment, nutrients and all other contaminants to the DCA via streams, stormwater or groundwater management infrastructure, or groundwater flows; or may alter the hydrology of the DCA.

11.1 Considerations for proposals and decisions

In accordance with section 7.7 of SPP 2.9, proposals and decisions should aim to ensure that planning and development protects and enhances the ecological health, community benefits, amenity and heritage value of the Swan Canning river system for the public benefit of Western Australia. This includes consideration of water resource management requirements at all planning stages and should be addressed in an applicable WMR, as described in Appendices B, C, D and E.

The proponent and decision-maker shall consider:

i. the operational policies, guidelines and water quality improvement plans of the Swan River Trust and DBCA applicable to the Swan Canning river system;

ii. ecological water requirements and hydrological regimes;

iii. the prevention of mobilisation of nutrients, non-nutrient contaminants and sediment from the development site to the rivers;

iv. protection and restoration of the natural ecosystem and hydrological functions of the river system, including river pools and channels, wetlands, tributaries, floodplain, saltmarshes and bushland associated with the rivers;

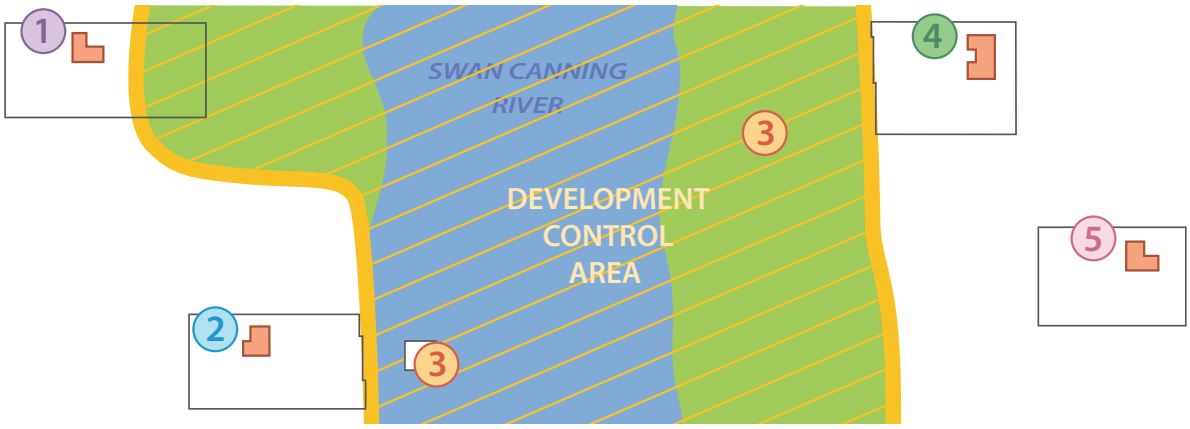
v. minimising channel disturbance and adverse impacts on river health by avoiding dredging where possible, except when used to re-establish ecological features or maintain existing navigation channels; and avoiding, where possible, filling/reclamation within the rivers and their floodplains (including temporary filling);

vi. the prevention of erosion of the riverbank and sediment transport;

vii. foreshore stabilisation practices that protect river ecosystems and minimise aesthetic and amenity impacts, including soft engineering, where appropriate;

viii. the maintenance of light access required by river ecosystems by managing artificial light spill and built-form overshadowing;

Figure 8: Swan Canning Development Control Area (DCA) determination process for development applications



Note: Development Assessment Panels may act in the place of WAPC, where relevant

ix. protection and re-establishment of aquatic and riparian vegetation, using endemic species wherever possible, to stabilise riverbanks, provide wildlife habitat, intercept nutrients, provide shade and improve river water quality;

x. ongoing management strategies to monitor and minimise adverse impacts on the river;

xi. the creation and maintenance of foreshore reserves to contribute to a continuous reserve network along the river foreshore and the expansion of existing reserves where considered an inadequate width;

xii. functional need of a structure to be located within the river and/or foreshore reserve and community benefit by way of public access to the foreshore and structure itself, when proposing public and/or commercial jetties, club facilities for water-based sports and similar structures;

xiii. the adequate setback of footpaths, cycleways and carparks from the river to prevent the need for future asset protection via foreshore stabilisation;

xiv. the context of the river setting, landscape features and the characteristics of the development site, including building height, bulk, scale, form, orientation and location, to maintain a sense of place and views of the river;

xv. minimise the contrast between the natural and built elements through landscape and vegetation integration;

xvi. using external finishes and materials based on materials and hues naturally occurring in the area;

xvii. the social, cultural, physical and historical setting of the river, as described in the Swan River System Landscape Description;

xviii. climate change and the need to mitigate against and adapt to predicted impacts. For example, design development to accommodate storm surges and rising river levels, which may include installation of structures that can be easily removed and allow for practical reinstatement of the foreshore; and/or create and maintain adequate foreshore reserves to accommodate storm surges and rising river levels;

xix. the adequate setback between the rivers and development in local planning schemes and other planning instruments, to allow for natural estuarine processes, conservation of environmental values, protection of significant landscapes, provision of public access and to maintain views to and from the river from public places;

xx. the design of bridges and culverts that provide for fauna movement and the retention of waterway alignments; and

xxi. clear demarcation between privately owned land and the foreshore reserve.

12 ROLES AND RESPONSIBILITIES

The management of water resources is the shared responsibility of landowners/proponents, government, service providers, industry and the community.
This section summarises the key responsible authorities and stakeholders, and their respective responsibilities in implementing SPP 2.9.

12.1 Landowners/proponents

In preparing their planning application landowners/ proponents are required to satisfy the requirements of SPP 2.9 and the Guidelines. This includes the preparation of a WMR, where required. Close consultation with relevant agencies during all stages of the planning process is necessary.

This should include, but not be limited to, consultation with:

i. DWER, in the provision of advice related to regulation, policy, guidance material and existing studies, potential impacts on water resources, including PDWSAs, groundwater, estuaries, wetlands and waterways;

ii. DBCA, in the provision of advice on biodiversity values, including threatened species and ecological communities, wetland delineation and evaluation and planning for the Swan Canning river system;

iii. DPIRD, in the provision of advice related to soil conservation and specifically for proposals comprising agricultural practices and nutrient management;

iv. DoH, in the provision of advice related to requirements for on-site wastewater systems, drinking water systems and mosquito, midge, disease vector management control;

v. the water service provider who will supply the proposed development; and

vi. local government in relation to management of future assets, locally sensitive water resources, on-site wastewater systems, engineering and design requirements and desired community outcomes.

12.2 Local governments

Local governments have the following responsibilities in relation to the implementation of SPP 2.9:

i. ensuring local planning instruments, including strategies, schemes, scheme amendments and structure plans have due regard to SPP 2.9 and the Guidelines;

ii. administering development controls in accordance with the local planning scheme, with due regard to SPP 2.9 and other policies and publications outlined in the Guidelines;

iii. preparation of any local planning policy in relation to water resources, including seeking advice from relevant agencies and/or service providers, and giving due regard to that advice;

iv. preparation of WMRs in support of local planning strategies, local planning scheme amendments and/ or local structure plans (where they are the proponent), including consideration of relevant advice from other agencies and/or service providers, and giving due regard to that advice;

v. provision of advice to the WAPC as to the adequacy of WMRs where appropriate;

vi. Provision of advice to DWER on any WMR in their local government area;

vii. provision of advice on proposals for on-site wastewater management including health and hydraulic loading matters, including where required, the adequacy of an SSE; and

viii. determination of development applications in accordance with SPP 2.9 and the Guidelines.

Local planning instruments should be considered as a mechanism for implementation of SPP 2.9 objectives. Appropriate mechanisms include:

1. special control areas, which can be used to designate flood prone areas, strategic resource precincts and PDWSAs;

2. local planning scheme provisions and zoning tables, to control land use and trigger the need for planning approval for developments; and

3. local planning policies, to support implementation of SPP 2.9 in local contexts for specific development aspects.

Local government should consider opportunities for implementation of SPP 2.9 objectives as part of any review or amendment to local planning schemes, strategies and/ or policy.

12.3 Department of Planning, Lands and Heritage (DPLH)

DPLH has the following responsibilities in relation to the implementation of SPP 2.9:

i. ensuring regional planning instruments determined or developed under delegated authority, including strategies, schemes and scheme amendments and structure plans, are aligned with the requirements set out in SPP 2.9 and the Guidelines;

ii. assessing and determining strategic proposals, subdivision and development applications under delegated authority in accordance with SPP 2.9 and the Guidelines;

iii. referring proposals to relevant State agencies and/or local government, and water service providers for comment and/or assessment;

iv. monitoring the implementation and effectiveness of SPP 2.9 and the Guidelines; and

v. the provision of advice to the Minister for Planning.

12.4 Department of Water and Environmental Regulation (DWER)

DWER has the following responsibilities in relation to the implementation of SPP 2.9:

i. provision of advice to decision-making authorities related to water resources, including PDWSAs, water allocation and supply planning, groundwater, stormwater, waterways and their estuaries and floodplains;

ii. preparation of drainage and water management plans, where appropriate, to address critical catchment-scale issues and management opportunities for high-risk priority development areas;

iii. preparation and review of drinking water source protection reports, water allocation plans, water quality improvement plans and undertaking water supply planning;

iv. provision of advice to decision-making authorities related to environmental management, including regulation of industry, native vegetation clearing and contaminated sites;

v. preparing and reviewing policies, guidelines and information that guide appropriate environmental and water resource management, many of which form key resources and reference documents that guide implementation of SPP 2.9;

vi. review and endorsement of Regional, District and Local WMRs, having consideration of and due regard to the advice of relevant State and local government and water services providers;

vii. providing support to the local government in their consideration of Subdivision and Development WMRs;

viii. administering, updating and providing advice on the implementation of water and environmental legislation; and

ix. updating instruments and mapping relating to water resources as required such as PDWSAs and floodplain mapping.

12.5 Environmental Protection Authority (EPA)

In relation to the implementation of SPP 2.9, the EPA is responsible for advising the State Government on the environmental impacts of development proposals and statutory planning schemes in accordance with Part IV of the *Environmental Protection Act 1986*.

12.6 Department of Biodiversity, Conservation and Attractions (DBCA)

DBCA has the following responsibilities in relation to the implementation of SPP 2.9:

i. review of Regional, District and Local WMRs and provision of advice on matters related to the *Biodiversity Conservation Act 2016*, including threatened species and ecological communities; the conservation estate and lands managed under the *Conservation and Land Management Act 1984*, including wetland delineation and evaluation, and the protection and management of the Swan Canning river system.

ii. performing its statutory planning functions for the Swan Canning river system; and

iii. updating instruments and mapping datasets relating to water resources as required.

12.7 Department of Primary Industries and Regional Development (DPIRD)

DPIRD has the following responsibilities in relation to the implementation of SPP 2.9:

i. provision of advice on the prevention and mitigation of land degradation, including salinity, flooding, soil erosion and eutrophication, in accordance with the *Soil and Land Conservation Act 1945*;

ii. management and licensing of aquaculture, including environmental management and biosecurity;

iii. provision of advice on stocking rates on rural small holdings;

iv. provision of advice on proposals for agricultural and aquaculture land use and development;

v. provision of advice on dams, crossings and rural drains, where relevant; and

vi. updating instruments and mapping relating to water resources as required such as soil-landscape and soil information, land capability information and phosphorus export hazard mapping.

12.8 Department of Health (DoH)

DoH has the following responsibilities in relation to the implementation of SPP 2.9:

i. provision of advice on proposals for on-site wastewater management, including public health and hydraulic loading matters, including where required, the adequacy of site and soil evaluations and WMR where appropriate;

ii. provision of advice related to the requirements for mosquito, midge and disease vector management and control;

iii. provision of advice on drinking water quality to protect public health; and

vi. updating instruments relating to water matters as required.

12.9 Western Australian Planning Commission (WAPC)

The WAPC has the following responsibilities in relation to the implementation of SPP 2.9:

i. assessing and determining proposals in accordance with SPP 2.9 and the Guidelines;

ii. referring proposals to relevant State agencies and/or local government, and water service providers for comment and/or assessment; and

iii. the provision of advice to the Minister for Planning.

12.10 Water service providers

Water (including drinking water, non-drinking water, wastewater and drainage) service providers have the following responsibilities in relation to the implementation of SPP 2.9:

i. consideration of, and planning for, service delivery requirements to support areas identified for urban expansion through regional and district planning stages; and

ii. the provision of advice related to connection to infrastructure in accordance with the *Water Services Act 2012*.

APPENDIX A
EXAMPLE OF AN INTER-DISCIPLINARY TEAM

Collaboration with State and local government, assessing authorities, regulators, service providers and the community (where appropriate) is encouraged to ensure that water resource matters have been considered holistically and managed appropriately.

In addition, it is recommended that an inter-disciplinary project team (refer to Table A.1) be established at project inception to develop and deliver integrated water resource management solutions. This will facilitate a greater understanding of any potentially competing objectives and design elements and provide an opportunity to optimise outcomes. To achieve this, the objectives for each discipline and the potential implications of a decision on a design element need to be understood and explored so any synergies can be enhanced and conflicts can be addressed. For example, a project engineer's objective may be to achieve dry lots, however, this strategy can result in the need to clear vegetation (through addition of fill) or impact the area of useable public open space in areas with high groundwater or poorly draining soils.

Table A.1: Example of an inter-disciplinary team for a Water Management Report (WMR)

Discipline	Discipline's main contribution to the WMR	Examples of design elements and issues considered by discipline	Examples of potential implications of design element decisions
Planner/ urban designer	Consideration of how Water Sensitive Design (WSD) elements are expected to be accommodated in the public realm	1. Access to water servicing 2. Placement of infrastructure to maximise multiple-use benefits 3. Streetscape/road reserves, public open space (POS) location and configuration 4. Public access roads and linear multiple-use corridors 5. Topographic constraints and opportunities	i. Implications for lot density/yield and/or development viability based on available water servicing sources and infrastructure ii. Narrower road reserves may not be able to accommodate raingardens/tree-pits iii. Locations of footpaths may reduce ability to use stormwater to passively irrigate trees iv. The location or configuration of POS may compromise drainage designs and drainage can compromise the functionality of POS v. Road alignments or location of public access ways may block or otherwise constrain important overland flood flow paths or change catchment calculations vi. Road layouts may result in increased spacing of subsoil drains and drive increased fill
Civil engineer/ hydrologist	Consideration of the critical elements of design for engineering assets	1. Catchment and modelling assumptions 2. Infrastructure connections 3. Catchment flood management 4. Groundwater and stormwater management 5. Multifunctional POS (locations and design details for storages) 6. Flowpaths in relation to road design, including kerbing 7. Road design	i. Overly conservative infiltration rates, failure to maintain pre-development hydrology and simplistic modelling assumptions will result in oversized infrastructure, increased maintenance costs and can reduce functionality of POS ii. Servicing strategies and/or land use/clearing can impact on site and local water balance iii. Constraints on the spatial extent of the urban form and elevations required to reduce the risk from flooding, while not impeding or increasing flood risk in the general area iv. Increased materials required for areas that are seasonally inundated and/or have high groundwater v. Installation of a Gross Pollutant Trap upstream of raingardens may reduce the frequency and volume of water entering the raingarden and impact raingarden plant health due to lack of water vi. Servicing strategies (particularly for gravity sewer) can increase actual fill requirements vii. Failure to accommodate upstream inflows may result in future flooding

Discipline	Discipline's main contribution to the WMR	Examples of design elements and issues considered by discipline	Examples of potential implications of design element decisions
			viii. Road design features, including camber and conventional kerbing, can block or impede overland flow paths ix. Sag locations can block or impede stormwater flows from entering stormwater management systems and/or prevent passive watering of street trees x. Land may be needed for treatment plants, odour and noise buffers, pump station and/or bore infrastructure xi. Overflow levels or pathways adjusted without consideration of hydraulic impacts may result in increased or premature flooding of surrounding land and/or private properties
Landscape architect	Consideration of the critical elements of design for WSD/landscape assets	1. Fit-for-purpose water supply 2. Species specification 3. Soil specification 4. Streetscape design	i. Plant specification may not accurately reflect access to passive watering and, therefore, may reduce survival and increase maintenance ii. Incorrect specification of soils (permeability and organic content) may cause inundation, plant death and/or poor downstream water quality iii. Landscape features and structures can block or impede stormwater flows to drainage systems and overland flow paths and/or prevent passive watering
Architect	Consideration of the critical elements of design for buildings	1. Use of green infrastructure (walls, facades, roofs) 2. Water-efficiency measures	i. Green infrastructure may not be viable without consideration of water availability and appropriate fit-for-purpose source planning ii. Predicted water demands may significantly vary if water-efficiency measures are not fully implemented
Soil scientists	Consideration of the critical elements of design for on-site sewerage systems	1. Impact of sewerage systems on the developable land 2. Soil type and permeability 3. Land application area	i. The size of the land application area for treatment and disposal depends on several factors, including the system used, soil type and slope ii. Impacts to sensitive receiving environments and biodiversity values
Environmental consultant	Consideration of the critical elements of design relevant to the site and surrounds, including impacted upstream or downstream environments	1. Protection of PDWSAs, sensitive water resource areas and other important environments 2. Runoff rates and catchment losses 3. Water balance 4. Water demand 5. Water quality impacts/risk assessment	i. Land and restoration requirements for waterway foreshore areas and/or wetland buffers ii. Land may be needed for treatment plants, odour and noise buffers, pump station and bore infrastructure iii. Risk of water balance changes resulting from drainage, clearing and increased or reduced groundwater use iv. Impacts to sensitive receiving environments and biodiversity values

APPENDIX B
REGIONAL WATER MANAGEMENT REPORT

B.1 Background

This appendix should be read in conjunction with section 5.2 and other relevant sections of the Guidelines.

Region schemes, sub-regional strategies, sub-regional frameworks, sub-regional structure plans, local planning schemes and local planning strategies are required to be informed by a Regional Water Management Report (WMR). The Regional WMR is required to demonstrate consideration of integrated water resource management at a strategic level to support the land use and development changes proposed in the plans.

A Regional WMR will generally be prepared by State Government and may cover more than one local government area. The Regional WMR should be developed in consultation with DWER, relevant State Government agencies, local government(s) and infrastructure managers/ owners and ultimately referred to DWER for endorsement, before WAPC approval.

Local planning strategies and schemes should be supported by water management information at a similar strategic level to regional planning instruments although may not require a full standalone water management report.

A Regional WMR seeks to:

i. identify and map PDWSAs and sensitive water resource areas;

ii. site and soil context;

iii. identify mechanisms to protect and manage water resources;

iv. consider the need for additional water sources to support the future land use; and

v. present information to guide subsequent stages of planning and design.

The information required to develop and inform a Regional WMR will vary significantly with the scale and complexity of the site and planning proposal but may include:

1. preliminary desktop site assessment;
2. surface water and groundwater mapping and monitoring;
3. desktop historical land use assessment;
4. water balance modelling – catchment level;
5. infrastructure services (water, wastewater and drainage) planning;
6. flood mapping and modelling;
7. mapping of sensitive water resource areas; and
8. information about Aboriginal heritage and other heritage values.

B.2 The requirements

Table B.1 outlines the components of a Regional WMR.

The level of detail provided in a Regional WMR is at a catchment level and broad scale. More detailed investigations will be required at subsequent planning stages to demonstrate the zoning can be supported in accordance with the Guiding Principles in section 2.

Table B.1: General requirements (where applicable) for a Regional WMR

Component	Description of requirements
Principles and objectives	Recognition of the requirements of SPP 2.9.
Planning context	For regional planning issues, scope the opportunities for achieving integrated water management solutions and commit to a process of integrated assessment and consideration.
Water resource context	1. Identification and mapping of water resources and associated buffers where relevant including: a) surface water catchments; b) waterways and their estuaries, inlets and floodplains; c) wetlands and their catchments; d) groundwater systems; e) natural and constructed drainage systems; f) sensitive water resource areas and other important environments; g) PDWSAs and their priority areas and protection zones; and h) catchment flooding and seasonal inundation. 2. Identification of options for existing and new secure, sustainable and fit-for-purpose water supplies and wastewater serves, including: a) location and capacity of existing and proposed water service facilities (water supply services, reticulated wastewater systems and plants, desalination plants, advanced water recycling plants and managed drainage systems); and b) availability of groundwater and surface water allocation. 3. Identification of Aboriginal heritage values and other heritage values, mapped as appropriate. 4. Identification and mapping of options for ecological linkages both within and connecting outside the strategy area and between water-dependent and terrestrial ecosystems.
Issues identification	1. Identification of water-related issues and a risk assessment to determine whether further work is required at this planning stage or whether it can be addressed in future stages of planning and strategies. 2. Identification of potential water quantity and quality impacts from proposed land use change. 3. Outline of regulatory requirements under water and environmental legislation. Notes: i. Guidance on specific water management requirements is provided in sections 6-11 of the Guidelines. ii. Technical reports may be required to address critical large-scale issues. For example, appropriate site and soil details may be required where large on-site wastewater servicing is proposed. Similarly, catchment scale flooding and inundation or water quality modelling may be undertaken at this stage where significant impacts are likely or in the catchments of sensitive water resource areas.
Water balance modelling[13] (if required)	Inclusion of pre-development catchment scale water balance modelling may be undertaken to inform the land use scenario assessment and identify risks to and from the environment. This may assist in the identification of new or altered fit-for-purpose water sources.
Water demand assessment[14] (if required)	1. Inclusion of a desktop assessment of water demands and wastewater generation associated with the proposed land uses and aligned to staged population forecasts. 2. Identification of the need and potential opportunities for new or augmented fit-for-purpose water sources and wastewater infrastructure required to meet demands, highlighting shortfalls requiring additional planning and opportunities for water reuse, recycling and infrastructure. 3. Where new water supply or wastewater infrastructure is proposed, consideration should be given to co-location to facilitate efficient and beneficial use of land, water and other resources. For example, a wastewater treatment plant co-located with regional playing fields or an industrial precinct to provide a fit-for-purpose water supply and minimise buffer requirements.
Implementation plan	Confirmation of requirements for future planning and development including: 1. Is a WMR required to inform future stages of planning and/or design and when? 2. What actions are required by whom to secure water supply and wastewater services? 3. What actions, including monitoring and investigations, are required by whom to address site-specific issues? 4. What controls and triggers have been put in place to avoid cumulative impacts occurring at the subsequent planning stages?
Other	Summation of critical information and design requirements for key disciplines to consider in future stages of planning and development.

[13, 14] In determining whether modelling is required, the proponent needs to consider the most efficient way to investigate and define the development potential of the lands.

APPENDIX C
DISTRICT WATER MANAGEMENT REPORT

C.1 Background

This appendix should be read in conjunction with section 5.3 and other relevant sections of the Guidelines.

A District WMR is prepared by a proponent to demonstrate the land can support the planning proposal and that appropriate water resource management and protection outcomes can feasibly be delivered.

District WMRs should be developed in consultation with DWER, relevant State Government agencies, local government(s) and infrastructure managers/owners, and will be ultimately referred to DWER for endorsement before WAPC approval.

A District WMR seeks to:

i. demonstrate the land can support the planning proposal and that appropriate water management solutions can be delivered, including land to be set aside;

ii. gain support for the proposed water management strategies for the site; and

iii. present critical information to guide subsequent stages of planning and design.

The information required to develop and inform a District WMR will vary significantly with the scale and complexity of the site and planning proposal but may include:

1. mapping of water resources and associated indicative buffers;
2. surface water monitoring (including flow, quality and level measurement);
3. groundwater monitoring (including quality and level measurement);
4. modelling of surface water and groundwater systems at an appropriate level of detail and/or complexity for the site and planning context, such as:
    a) site drainage modelling;
    b) floodplain modelling;
    c) surface and groundwater interactions modelling; and
    d) water balance modelling;
5. desktop historical land use assessment;
6. geotechnical investigations, including soil profile, permeability and nutrient retention capacity;
7. flora, fauna and vegetation surveys;
8. vegetation type mapping and condition assessment;
9. tree type and condition assessment;
10. feature survey;
11. assessment of available drinking water and non-drinking water;
12. assessment of sewerage system capacity or land capability where on-site wastewater management systems are proposed; and
13. Information about Aboriginal Heritage and other heritage values.

Additional modelling or design work may be required for site-specific requirements.

C.2 The requirements

Table C.1 outlines the components of a District WMR.

The level of detail provided in a District WMR will vary in response to the size and/or complexity of the proposal and pre-development site in accordance with the Guiding Principles in section 2.

Table C.1: General requirements (where applicable) for a District WMR

Component	Description of requirements
Principles and objectives	1. Recognition of the requirements of SPP 2.9 and other relevant State planning instruments, including Regional WMRs where relevant. 2. Identification of site-specific water management objectives, outcomes and design criteria to be achieved in relation to: a) protection of water resources and other important environments; b) stormwater and groundwater management; c) water-efficiency and fit-for-purpose use; and d) achieving liveability outcomes.
Planning context	Identification of the current and next planning stage, any existing higher order plans and strategies, as well as existing planning approvals or conditions on or adjacent to the site.
Water resource context	1. Identification, characterisation[15], and mapping of water resources, including: a) surface water catchments and associated landform and geotechnical conditions; b) waterways and their estuaries, inlets, floodplains[16], indicative foreshore areas and reserves; c) wetlands, their catchments and indicative buffers; d) groundwater systems and associated hydrogeology; e) natural and constructed drainage systems; f) sensitive water resource areas and other important environments; g) PDWSAs and their priority areas and protection zones; and h) catchment flooding and seasonal inundation. 2. Identification of Aboriginal heritage values and other heritage values. These areas should be mapped where appropriate. 3. Identification and mapping of ecological linkages both within and connecting outside the strategy area and between water-dependent and terrestrial ecosystems. 4. Identification and mapping of available fit-for-purpose water sources and wastewater servicing capacities. 5. Discussion of parameters and assumptions for use in modelling and/or design processes, supported by results and findings of monitoring and site investigations where available, including: a) in-situ soils hydraulic conductivity and recommended design infiltration rate; b) in-situ soils nutrient retention capacity; c) catchment slope, land use and roughness; d) runoff rates and catchment losses; e) rainfall event intensity, frequency and duration patterns; and f) annual and seasonal rainfall and evaporation rates.
Issues identification	1. Identification of water resource risks and issues (quantity and quality) relevant to the development of the site, including: a) potential sources of contamination, including acid sulfate soils; b) risk of water balance changes resulting from drainage, land clearing and increased or reduced groundwater use; c) impacts to water quantity and quality from proposed land use change; d) risk of flooding or inundation (surface water and/or groundwater); e) water source and system availability and capacity (drinking and non-drinking); f) wastewater treatment system availability and capacity and separation distances; g) drainage system availability, capacity and separation distances; and h) sensitive water resource areas, PDWSAs and other important environments. 2. Where appropriate, identification of water-related issues to be addressed in future stages of the planning process. Notes: i. Guidance on specific water management requirements is provided in sections 6-11 of the Guidelines. ii. If drinking water is unavailable from an existing drinking water supply network, the WMR should demonstrate the technical viability and financial sustainability of establishing a drinking water supply, including infrastructure planning (refer to section 8.2). iii. If non-drinking water is unavailable from groundwater or surface water resources, the WMR should identify technically viable and financially sustainable alternative non-drinking water source options (refer to section 8.2).

[15] Characterisation means a detailed description of the key characteristics of the water resource and should include both qualitative and quantitative information.

[16] Floodplains are relevant to both the 'Water resource context', for example their values, physical condition and ecological health; and under 'Stormwater and groundwater management strategy' for flood risk management.

Component	Description of requirements
Water balance modelling (if required)	1. Inclusion of pre-and post-development water balances to inform the determination of hydrological regimes of water-dependent ecosystems to be protected, likely groundwater rises and options for use of drinking and non-drinking water sources. 2. Identification of future infrastructure requirements, options and necessary approvals. Notes: Sites likely to require a site water balance at this stage include sites that are in PDWSAs.
Water demand assessment	Inclusion of a water and wastewater demand assessment. The assessment should be aligned to staged population forecasts and identification of available fit-for-purpose water sources required to meet demands, applying water-efficiency principles and highlighting shortfalls requiring additional planning and opportunities for water reuse and recycling. Notes: i. Where a shortfall in available drinking and non-drinking water sources is identified, including for irrigation of public open spaces and schools, water source planning should be undertaken to provide details of the arrangements and land areas required to provide for additional water supplies, and the ongoing costs of providing these. This includes, where relevant, roles and responsibilities, funding models for capital and operational costs, and triggers for infrastructure development, to take account of staged development and minimum operating volumes for varying systems (refer to section 8.2). ii. Where groundwater is identified as the preferred water source for irrigation of public open spaces and schools, any potential shortfall in availability or high-level of competition anticipated for access to the remaining resource should be identified. Where this is the case, consideration should be given to the establishment of a single overarching groundwater licence held by the local government and based on an agreed schedule for delivery of public open space.
Water and wastewater strategy	Confirmation of servicing strategy for drinking water, non-drinking water and wastewater and proposed water-efficiency strategies to achieve targets. Notes: i. Where additional capacity is required in water, wastewater or drainage systems or alternative servicing arrangements are proposed, infrastructure planning should be undertaken to provide details of the arrangements and land areas required to provide for new or modified infrastructure. Refer to section 8.2. ii. Where new wastewater treatment plants are proposed, consideration should be given to co-location to facilitate efficient and beneficial use of land, water and other resources. For example, a wastewater treatment plant co-located with regional playing fields or an industrial precinct to provide a fit-for-purpose water supply and minimise buffer requirements. Refer to section 8.2.
Stormwater and groundwater management strategy	1. Identification of strategy and land areas required for management of stormwater to satisfy the requirements of relevant State and local government policies and to address stated principles, objectives and design criteria in relation to: a) the annual water and long-term balance (including a definition of an appropriate controlled groundwater level for protection of sensitive water resource areas and other important environments); b) small rainfall events; c) minor rainfall events; and d) major rainfall events. 2. Identification of cross-boundary requirements and catchment elements of design including invert levels, flood levels and flow rates at cadastral and/or staged planning boundaries to avoid off-site impacts or cumulative impacts at subsequent planning stages. Catchment drainage planning may need to be undertaken if it has not already been completed for the catchment. Notes: i. Flood risk management is required for sites identified in floodplain mapping or on land likely to be impacted by flooding where no floodplain has been defined. Refer to section 7. ii. Stormwater management systems should be designed consistent with the *Decision Process for Stormwater Management in WA* (DWER, 2017), *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022), *Australian Rainfall and Runoff* (Commonwealth of Australia (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I) 2019) and the latest version of *Local Government Guidelines for Subdivisional Development* (IPWEA). iii. Where installation of a drainage system to control or lower groundwater levels is proposed and has the potential to adversely affect sensitive water resource areas or other important environments, further investigation and justification of the strategy are required as part of the WMR, including definition of discharge locations, treatment requirements and an acceptable controlled groundwater level.

Component	Description of requirements
Monitoring program	1. Definition of pre-development requirements to inform any future Local WMRs and an outline of post-development requirements to improve understanding of environmental impacts of development where necessary. 2. Consideration of impacts on public health in PDWSAs (in accordance with *Australian Drinking Water Guidelines*). Notes: i. Monitoring should be in accordance with Guiding Principles and section 5. ii. For more information and guidance on water monitoring, refer to *Water monitoring guidelines for better urban water management strategies and plans* (DoW, 2012).
Implementation plan	Confirmation of requirements for future stages of planning and development including: 1. Is a WMR required to inform future stages of planning and/or design and when? 2. What actions are required by whom to secure water services? 3. What actions, including monitoring and investigations, are required by whom to address site-specific issues? 4. What controls and triggers have been put in place to avoid cumulative impacts occurring at the subsequent planning stages?
Other	1. Summation of critical information and design requirements for key disciplines to consider in future stages of planning and development. 2. Inclusion of maps and drawings to present key information including: a) location plan, site context plan and/or subdivision layout plan; b) structure plan; c) site condition plan, geotechnical plan and/or environmental plan; d) surface water context plan, and conceptual system layout showing modelling results for small, minor and major rainfall events; e) groundwater context plan; and f) landscape plans and typical cross-sections for water management systems integrated with streetscapes and public open spaces.

APPENDIX D
LOCAL WATER MANAGEMENT REPORT

D.1 Background

This appendix should be read in conjunction with section 5.4 and other relevant sections of the Guidelines.

A Local WMR demonstrates 'proof of concept' for the water management systems and strategies proposed for implementation through detailed design and development.

A Local WMR seeks to:

i. demonstrate how proposals have responded to site-specific water-related issues and opportunities and how they will achieve the outcomes of the SPP 2.9;

ii. gain approval for water management strategies and conceptual designs for the site; and

iii. present critical information to guide subsequent stages of planning and design.

Local structure plans and precinct structure plans (including masterplans and activity centre plans) are always required to be informed by a WMR. Water planning and design is a critical element of this process and requires preliminary design of conceptual 'whole of development' water management systems and strategies to guide detailed designs that may be developed stage by stage.

The WMR should be developed in consultation with DWER, relevant State Government agencies, local government(s) and infrastructure managers/owners and ultimately submitted to DWER for endorsement. Where the local government is not the decision-maker they should support the Local WMR before finalisation.

The information required to develop and inform a Local WMR will vary significantly with the scale and complexity of the site and planning proposal but may include:

1. mapping of water resources and associated confirmed buffers;
2. surface water monitoring (including flow, quality and level measurement);
3. groundwater monitoring (including quality and level measurement);
4. modelling of surface water and groundwater systems at an appropriate level of detail and/or complexity for the site and planning context. This could include:
   a) site drainage modelling;
   b) floodplain modelling;
   c) surface and groundwater interactions modelling; and
   d) water balance modelling;
5. desktop historical land use assessment;
6. geotechnical investigations, including soil profile, permeability and nutrient retention capacity;
7. flora, fauna and vegetation surveys;
8. vegetation type mapping and condition assessment;
9. tree type and condition assessment;
10. feature survey;
11. assessment of available drinking water and non-drinking water;
12. assessment of sewerage system capacity or land capability where on-site wastewater management systems are proposed; and
13. Information about Aboriginal Heritage and other heritage values.

Additional modelling or design work may be required for site-specific requirements.

D.2 The requirements

Table D.1 outlines the components of a Local WMR.

The level of detail provided in a Local WMR will vary in response to the size and/or complexity of the proposal and pre-development site in accordance with the Guiding Principles in section 2.

Table D.1: General requirements (where applicable) for a Local WMR

Component	Description of requirements
Principles and objectives	1. Recognition of the requirements of SPP 2.9 and other relevant State planning instruments, including Regional/ District WMRs. 2. Identification of relevant site-specific water management objectives and outcomes to be achieved.
Planning context	Identification of the current and next planning stage, any existing higher order plans and strategies, as well as existing planning approvals or conditions on or adjacent to the site.
Water resource context	1. Identification, characterisation[17] and mapping of water resources, including determination of appropriate buffers and foreshore areas if they have not previously been identified, and supported by results and findings of monitoring and site investigations, including: a) surface water catchments and associated landform and geotechnical conditions; b) waterways and their estuaries, inlets, floodplains[18], foreshore areas and reserves, wetlands, their catchments and buffers; c) groundwater systems and associated hydrogeology; d) natural and constructed drainage systems; e) sensitive water resource areas and other important environments; f) PDWSAs and their priority areas and protection zones; and g) catchment flooding and seasonal inundation. 2. Identification of Aboriginal heritage values and other heritage values. These areas should be mapped where appropriate.
Issues identification	1. Identification of water resource risks and issues relevant to the development of the site, including: a) potential sources of contamination, including acid sulfate soils; b) risk of water balance changes resulting from drainage, land clearing and increased or reduced groundwater use; c) impacts to water quantity and quality from proposed land use change; d) risk of flooding or inundation (surface water and/or groundwater); e) water source and system availability and capability (drinking and non-drinking); f) wastewater treatment system availability, capacity and buffers; g) drainage system availability and capacity; h) regulatory requirements under water and environmental legislation; i) sensitive water resource areas, PDWSAs, other important environments and other important environments requiring protection; and j) where appropriate, identification of water-related issues to be addressed in future stages of the planning process. Notes: Guidance on specific water management requirements is provided in sections 6-11 of the Guidelines.
Water balance modelling	1. Inclusion of a detailed pre-and post-development site water balance is required to quantify likely changes in response to development. Critical elements of the water balance that should be considered include: a) infiltration and recharge; b) runoff and drainage; c) evapotranspiration; and d) new water brought if it is sourced from a disconnected surface water catchment or confined aquifer. Notes: The findings of the site water balance should be considered throughout the WMR and applied to inform an integrated water resource management approach to minimise associated risks to and from the environment.
Water demand assessment	Inclusion of a water and wastewater demand assessment for all proposed uses demonstrating application of water conservation and efficiency strategies to achieve relevant targets.

[17] Characterisation means a detailed description of the key characteristics of the water resource and should include both qualitative and quantitative information.

[18] Floodplains are relevant to both the 'Water resource context', for example their values, physical condition and ecological health; and under 'Stormwater and groundwater management strategy' for flood risk management.

Component	Description of requirements
Water and wastewater servicing strategy	1. Confirmation of connection to drinking and fit-for-purpose non-drinking water (including irrigation of public open spaces and schools) and wastewater services with secure water service providers. 2. Inclusion of design information for proposed water distribution systems and/or wastewater collection systems, including pipe layouts. 3. Identification of locations for key infrastructure elements, including storage tanks, pumping stations and associated buffers, groundwater bores including wellhead protection zones, and treatment systems and associated buffers. This includes triggers for infrastructure development, to take account of staged development and minimum operating volumes for varying systems. Notes: i. Where an alternative approach to drinking or non-drinking water supply or wastewater servicing is proposed, it is necessary to provide confirmation of service delivery arrangements, including ongoing management roles and responsibilities and any interim and/or staging requirements. Guidance is provided in the *Guideline for the Approval of Non-Drinking Water Systems in Western Australia* (DoW, 2013). Refer to section 8.2. ii. Where on-site wastewater disposal is proposed, the WMR should include a site and soil evaluation in accordance with AS/NZS 1547 to demonstrate the site is suitable for long-term on-site wastewater disposal. The level of information required will be commensurate with the scale and nature of the proposal. Refer to section 8.7.6.
Stormwater and groundwater management design	1. Inclusion of surface water management system design details and modelling results including: a) presentation and justification of modelling parameters; b) demonstration of compliance with inflows and outflows specified in the WMR for previous planning stages or defined through catchment scale modelling; c) design of small rainfall event management systems; d) design of minor rainfall event management systems, including conveyance system layout, invert levels, hydraulic grade lines and dimensions; e) design of major rainfall event management systems, including overland flowpath layouts and dimensions including flow depths and velocities; f) storage system invert levels, high water marks and dimensions; and g) integrated street and landscape designs. 2. Where temporary dewatering is required, outline of the requirements, including how the quality and quantity of the dewatering discharge will be managed. 3. Where groundwater management (permanent dewatering) is required, inclusion of design details and modelling results are required to be provided in the WMR, including: a) presentation and justification of modelling parameters; b) definition of an appropriate controlled groundwater level for protection of sensitive water resource areas and other important environments; c) design of groundwater management system, including system layout, critical invert levels, demonstration of a free-draining outlet, integration with stormwater management and a workable earthworks strategy; d) predicted groundwater levels between subsurface drainage lines and relationship to buildings, infrastructure, open spaces and environmental impacts; and e) design of water quality treatment systems (where required) to treat groundwater discharged from subsoil drains and temporary dewatering systems. Notes: i. Stormwater management systems should be designed consistent with the Decision Process for Stormwater Management in Western Australia (DWER, 2017), *Stormwater Management Manual for Western Australia* (DWER, 2004-2007, updated 2022), *Australian Rainfall and Runoff* (Commonwealth of Australia (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I) 2019), the latest version of *Local Government Guidelines for Subdivisional Development* (IPWEA) and any other site-specific documents. ii. Where a new catchment drainage system is required, the WMR should provide details of the proposed implementation strategy to ensure the service is delivered ahead of staged development. Refer to section 8.6. iii. Flood risk management is required for sites identified in floodplain mapping or on land likely to be impacted by flooding where no floodplain has been defined. Refer to section 7.
Earthworks strategy	Inclusion of preliminary earthworks model that aligns to proposed stormwater subcatchments and demonstration that proposed locations for street-scale design elements are viable. For instance, identification of proposed roadside raingardens or swales should coincide with sag locations. Notes: Where management of a groundwater system is required, design details and modelling results integrating with the proposed earthworks model are required. Refer to section 8.5.

Component	Description of requirements
Water quality management strategy	1. Inclusion of water quality modelling to demonstrate compliance with relevant water quality targets. Water quality targets are provided in water quality improvement plans and can be site-specific. 2. Consideration of separation distances from waterways and wetlands required to protect water quality (in addition to waterway foreshore areas and wetland buffers).
Management of works	Confirmation of requirements for protection of the environment and management of construction activities, including dewatering, acid sulfate soils, constructed best management practices, and dust, sediment and erosion control, timing and possible staging.
Monitoring program	Inclusion of a sampling and assessment plan that contains duration and arrangements for ongoing actions. Notes: i. Monitoring should be in accordance with Guiding Principles and section 5. ii. For more information and guidance on water monitoring, refer to *Water monitoring guidelines for better urban water management strategies and plan*s (DoW 2012).
Maintenance plan	Confirmation of requirements for maintenance of proposed assets, systems and strategies to inform future asset owners and managers.
Implementation plan	1. Confirmation of requirements for future planning and development including: a) Is a WMR required to inform future subdivision and/or development? b) Who is responsible for detailed design and construction of the site and water, wastewater and drainage systems? c) What staging is proposed over what timeframe? d) What actions are required by whom and when to address remaining site-specific issues, including management and restoration of wetlands and their buffers and waterways and their foreshore area?
Other	1. Summation of critical information and design requirements for key disciplines to consider in future stages of planning and development. 2. Inclusion of maps and drawings to present key information. These may include: a) location plan, site context plan and/or subdivision layout plan; b) structure plan; c) site condition plan, geotechnical plan and/or environmental plan; d) surface water context plan, and conceptual design drawings showing modelling results for small, minor and major rainfall events; e) groundwater context plan, typical cross-sections and conceptual design drawings; and f) landscape plans and typical cross-sections for water management systems integrated with streetscapes and public open spaces.

APPENDIX E
SUBDIVISION AND DEVELOPMENT WATER MANAGEMENT REPORT

E.1 Background

This appendix should be read in conjunction with section 5.5 and other relevant sections of the Guidelines.

A Subdivision and Development WMR is required to demonstrate in detail how water management matters within or impacted by the development will be appropriately managed. A Subdivision and Development WMR is not required if there is an approved WMR (usually Local WMR) that provides guidance for development of the site, confirms no further WMR is required and the proposal does not significantly differ from the approved WMR.

Where a Subdivision and Development WMR is required, it is necessary for the WMR to be submitted to the WAPC and/or local government for consideration as part of the assessment of the planning application. The WAPC or the local government may seek advice from the relevant agencies on the suitability of the information provided in the WMR to inform decision-making and instigate a "stop the clock" if the report does not provide sufficient information.

The information required to develop and inform a Subdivision and Development WMR will vary significantly with the scale and complexity of the site and planning proposal but may include:

1) management of water-dependent ecosystems;
2) surface water monitoring and modellings (including for 1EY (one exceedance per year) event);
3) groundwater monitoring and modelling (map groundwater level contours – existing and proposed, identify floor level heights and fill requirements, identify groundwater recharge rates, subsoil strategy (if relevant) and identify nutrient and all other contaminant levels and transportation pathways;
4) more detailed geotechnical investigations, including soil profile, permeability and nutrient retention capacity;
5) conservation and efficient use of drinking water;
6) a foreshore management plan or wetland management plan (if relevant); and
7) management of water quality and water quantity levels from temporary or permanent dewatering isocharge on sensitive water resource areas and other important environments.

E.2 The requirements

Table E.1 outlines the components of a Subdivision and Development WMR.

The level of detail provided will vary in response to the size and/or complexity of the proposal and pre-development site) in accordance with the Guiding Principles in section 2.

Table E.1: General requirements (where applicable) for a Subdivision and Development WMR

Component	Description of requirements
Principles and objectives	1. Recognition of the requirements of SPP 2.9 and other relevant State planning instruments, including Regional/ District/Local WMRs where relevant. 2. Identification of relevant site-specific water management objectives and outcomes to be achieved.
Planning context	Identification of any existing district and/or local plans and strategies, as well as existing planning approvals or conditions on or adjacent to the site.
Site characteristics and issues	1. Identification of key site characteristics that affect water management within the site (including seasonal variations). These may include: a) environmental features requiring protection such as sensitive water resource areas, PDWSAs, wetlands and their buffers, waterways and their foreshores areas, other important environments, Aboriginal heritage values and other heritage values; b) environmental conditions requiring management such as flood risk, natural and constructed drainage systems, potential impacts to PDWSAs, nutrient and irrigation management, contaminated sites, acid sulfate soils and land uses with potential to impact on water quality; and c) geotechnical conditions such as topography, soil descriptions, site classification zones, proposed earthworks and approximate finished contour levels. 2. Identification of water supply risks and issues relevant to the development of the site, including, where relevant, groundwater licensing, bore construction and yield testing details. 3. Identification of regulatory requirements under water and environmental legislation. 4. Identification of water management systems that have been implemented and include provision for the site such as constructed water distribution systems, wastewater collection systems, and drainage and flood management systems, including overland flow paths and water quality management systems. 5. Identification of proposed public open space, water source bore(s), water requirements and water balance and indicative irrigation schedule. Notes: i. Additional detail may be required where no previous WMR exists. This may include, where appropriate, mapping of water resources, supported by results and findings of monitoring and site investigations, including surface water catchments, waterways and their floodplains, estuaries, inlets and foreshore areas, wetlands and their buffers, groundwater aquifers, depth to groundwater and drainage network designs. ii. As mentioned in section 6.1.3, a foreshore management plan or wetland management plan may be required to support the WMR. iii. Guidance on specific water management requirements is provided in sections 6-11 of the Guidelines.
Water balance modelling (where required)	1. Inclusion of a detailed site water balance may be required to quantify likely changes in response to the development that have not been adequately addressed in a previous WMR. Critical elements of the water balance that should be considered include: a) infiltration and recharge; b) runoff and drainage; c) evapotranspiration; and d) new water (for example, if it is sourced from a disconnected surface water catchment or confined aquifer). 2. Sites likely to require a site water balance at this stage include: a) sites located within a sensitive water resource area; b) proposals requiring a nutrient irrigation management plan; and c) constrained sites with restricted outfall.
Water demand assessment (where required)	Inclusion of a water demand assessment demonstrating application of water conservation and efficiency to achieve relevant targets may be required where this has not been adequately addressed in a previous WMR.
Water and wastewater servicing strategy	1. Confirmation of connection to drinking and non-drinking water (including irrigation of public open spaces and schools) and wastewater service delivery arrangements. 2. Where an alternative approach to drinking or non-drinking water supply or wastewater servicing is proposed, confirmation of service delivery arrangements is necessary, including ongoing management roles and responsibilities and any interim and/or staging requirements where this has not been adequately addressed in a previous WMR. 3. Where on-site wastewater disposal is proposed, inclusion of a site and soil evaluation in accordance with AS/ NZS 1547 is required to demonstrate the site is suitable for long-term on-site wastewater disposal. The level of information required will be commensurate with the scale and nature of the proposal.

Component	Description of requirements
Stormwater and groundwater management design	1. Inclusion of stormwater and groundwater management plans supported by relevant stormwater and groundwater modelling for the site, where it has not been provided in enough detail in higher level documents. Information required in the WMR may include, where relevant: a) presentation and justification of modelling parameters; b) demonstration of compliance with inflows, storage volumes and outflows specified in higher order water planning documents or defined through catchment scale modelling; c) design of small rainfall event management systems for the development site; d) design of minor rainfall event management systems including layout, invert levels, hydraulic grade lines; e) design of major rainfall event management systems including overland flowpath layouts and dimensions including flow depths and velocities, safety criteria; storage system invert levels, high water levels and dimensions; f) design of subsoil drains including invert levels, demonstration of a free draining outlet, integration with stormwater management and a workable earthworks strategy; g) predicted groundwater levels between subsurface drainage lines and relationship to buildings, infrastructure, open spaces and environmental impacts; h) design of water quality treatment systems to treat groundwater discharged from subsoil drains and temporary dewatering systems; and i) integrated street and landscape designs. Notes: i. Additional detail may be required where no previous WMR exists and/or there are site-specific issues to address. This may include: a) proposals including construction of new drains or modification of existing drains; b) sites impacted by any published floodplain mapping or containing areas designated as 'floodway'; and c) sites on land likely to be impacted by flooding where no floodplain has been defined. ii. Design objectives for stormwater management are provided in the *Decision Process for Stormwater Management in Western Australia* (DWER, 2017) and relevant drainage and water management plans. iii. For non-urban developments the principles of the *Decision Process for Stormwater Management in Western Australia* (DWER, 2017) are still relevant.
Management of works	Confirmation of requirements for protection of the environment and management of construction activities including dewatering, acid sulfate soils, best management practices, dust, approvals for drainage or groundwater pumping, sediment and erosion control, timing and possible staging.
Monitoring program	1. Inclusion of a sampling and assessment plan that contains duration and arrangements for ongoing actions. 2. Monitoring in accordance with Guiding Principles (refer to section 2).
Maintenance plan	Confirmation of requirements for maintenance of proposed assets, systems and strategies to inform future asset owners and managers.
Implementation plan	1. Confirmation of requirements for future planning and development including: a) Who is responsible for detailed design and construction of the site and water, wastewater and drainage systems? b) What staging is proposed over what timeframe? c) What actions are required by whom and when to address any remaining site-specific issues, including restoration of wetlands and their buffers and waterways and their foreshore areas?
Other	1. Inclusion of maps and drawings to present key information. These may include: a) location plan, site context plan and/or subdivision layout plan; b) subdivision plan or building layout; c) site condition plan, geotechnical plan and/or environmental plan; d) surface water management system design drawings showing modelling results for small, minor and major rainfall events; e) groundwater management system design drawings and typical cross sections; f) alternative supply schematic and plan; g) nutrient and irrigation management plan; h) rehabilitation plan; i) irrigation system design drawings and bore construction details; and j) landscape plans and typical cross sections for water management systems integrated with streetscapes and public open spaces.

APPENDIX F
SITE REQUIREMENTS FOR ON-SITE WASTEWATER SYSTEMS

F.1 Minimum lot sizes for residential development in clay soils and rock

Table F.1: Minimum lot sizes for residential development serviced by on-site wastewater disposal in clay soils and rock located outside PDWSAs and sensitive water resource areas

Soil category[19]	Soil texture	Minimum lot sizes m² (R-code)[20]	
		Primary treatment	Secondary treatment
4	Clay loams	2,000 (R5)	1,000 (R10)
5	Light clays	4,000 (R2.5)	1,000 (R10)
6	Medium to heavy clay	Special design requirements and distribution techniques or soil modification procedures will be necessary. Refer to Table L1 of *AZ/NZS 1547* for more details.	2,000 (R5)
–	Rock	Special design requirements and distribution techniques or soil modification procedures will be necessary.	

F.2 Calculating land application area size based on wastewater volume

The size of the land application area can be determined as follows:

1. Estimate hydraulic load (L/day):
   a) occupancy rate (persons) x design loading rate (L/person/day)
2. Calculate land application area (m²):
   a) hydraulic load (L/day) x conversion factor from Table F.2.

Table F.2: Conversion factors to calculate the minimum required land application area for subdivision/development (conversion factors are determined using hydraulic load of 1 L/day)

Soil category	Soil texture	Conversion factors	
		Primary treatment	Secondary treatment
1	Gravels and sands	0.377	0.2
2	Sandy loams	0.377	0.2
3	Loams	0.477	0.25
4	Clay loams	0.689	0.286
5	Light clays	1.284	0.333
6	Medium to heavy clays	Special design requirements and distribution techniques or soil modification procedures will be necessary	0.5

[19] Soil categories, extrapolated from Table 5.1 AS/NZS 1547, are to be determined by undertaking an SSE as per *Australian Standard AS/NZS 1547 On-Site Domestic Wastewater Management* (Standards Australia/New Zealand Standard, 2012).

[20] Minimum lot sizes are based upon area required to accommodate dwelling, primary on-site wastewater system, land application areas and associated setback distances.

F.3 Land application areas for single houses

Table F.3: Land application areas for single house (occupancy: six persons/five-bedroom house)

Soil category	Soil texture	Land application area (m^2)[21]	
		Primary treatment (includes area required for setbacks)	Secondary treatment (excludes setbacks)
1	Gravels and sands	339	180
2	Sandy loams	339	180
3	Loams	429	225
4	Clay loams	620	257
5	Light clays	1,156	300
6	Medium to heavy clays	Special design	450

Table F.3 may be used to inform residential subdivision applications. It is based upon Table F.2. Different sized areas may be required at development or building stage in response to anticipated hydraulic load.

A sample calculation for determining the land application area for a primary treatment system in Soil Categories 1 and 2 is provided in Figure F.1.

Figure F.1: Sample calculation for determining the land application areas for a single house with primary treatment system in soil categories 1 and 2

Calculation

	Hydraulic loading	900 L/day
÷	Design loading rate (As per AS1547)	20 mm/day
÷	Width of standard concrete leach drain (400 mm)	0.4 m
=	Area required for drainage	112.5 m
÷	Recommended length of drains	≅ 20m
=	Number of drains required (Note: must be an even number of drains)	(a) 4 @ 28 m (b) 6 @ 18.75 m

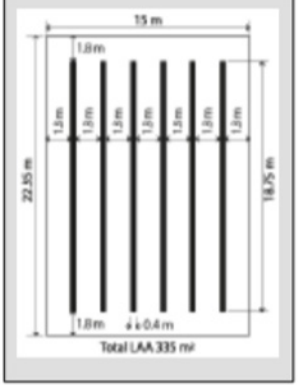
Length of land application area

	Length of drain	(b) 18.75 m
+	2 x setbacks	1.8 m x 2
=	Under Health Regulations 1974 length of LAA	22.35 m

Width of land application area

	Width of each drain	(b) 0.4 x 6
×	Number of drains	= 2.4
+	Separation between each drain (min 1.8 m)	+ 1.8 x 5 = 9.0
+	Setback under Health Regulations 1974 x 2	+ 3.6 = 15 m
	Length x Width = Land Application Area	= 335 m^2

Note: *AS/NZS 1547* recommends maximum drain lengths of 20 metres. Longer lengths may be possible if even distribution can be demonstrated.



[21] The land application area has been determined using design loading rates for trenches and beds, extrapolated from Table L1 Australian Standard AS/NZS 1547 On-Site Domestic Wastewater Management (Standards Australia/New Zealand Standard, 2012). Calculations used a hydraulic loading of 900 litres/day, which is based on the occupancy of six persons in a five-bedroom house and a wastewater design flow of 150L/person/day. Values for primary treatment include setback distances. Note that values for secondary treatment exclude setback distances, which will vary depending on the system used.

F4 Localities outside the Metropolitan Region Scheme and Peel Region Scheme areas with reticulated sewerage schemes[22]

The following localities have established reticulated sewerage schemes. Lots outside these localities are generally serviced with on-site wastewater systems.

Albany
Augusta
Australind
Beverley
Binningup
Boddington
Bootenall
Boulder
Boyanup
Bremer Bay
Bridgetown
Brookton
Broome
Bruce Rock
Brunswick
Bunbury
Burekup
Busselton
Calingiri
Capel
Carnarvon
Cervantes
Christmas Island
Cocos Island
Collie
Coolgardie
Coral Bay
Corrigin
Cowaramup
Cranbrook
Cunderdin
Dalwallinu
Dalyellup
Dampier
Dardanup
Denham
Denison
Denmark
Derby
Dongara
Donnybrook
Dowerin
Dumbleyung
Dunsborough
Eaton
Emu Point
Eneabba
Esperance
Exmouth
Finucane Island
Fitzroy Crossing
Geraldton
Gnarabup
Gnowangerup
Goomalling
Green Head
Greenough
Halls Creek
Harvey
Hopetoun
Horrocks
Hyden
Jerramungup
Jurien Bay
Kalbarri
Kalgoorlie
Kambalda
Karratha
Katanning
Kellerberrin
Kojonup
Koolyanobbing
Koorda
Kulin
Kununurra
Lake Argyle
Lake Grace
Lancelin
Laverton
Ledge Point
Leeman
Leinster
Leonora
Lower King
Manjimup
Margaret River
Marvel Loch
Meckering
Merredin
Moora
Morawa
Mount Barker
Mukinbudin
Mullewa
Munglinup
Nannup
Narembeen
Narrogin
Newdegate
Newman
Norseman
Northam
Nyabing
Ongerup
Onslow
Pannawonica
Paraburdoo
Pemberton
Picton
Pingelly
Pingrup
Port Hedland
Prevelly
Quairading
Quindalup
Ravensthorpe
Roebourne
Seabird
South Hedland
Southern Cross
Tambellup
Three Springs
Tom Price
Toodyay
Varley
Wagin
Walpole
Wickepin
Wickham
Williams
Wiluna
Wongan Hills
Wundowie
Wyalkatchem
Wyndham
Yerecoin
York

[22] As at 1/12/2017