Draft Liveable Neighbourhoods Review 2015 – CRC for Water Sensitive Cities

The way we manage urban water influences almost every aspect of our urban environment and quality of life. Because water has had, and will continue to have, a direct influence on the resilience and liveability of Perth, planning and design for development and redevelopment of the metropolitan area needs to be integrated with the planning and development of future water systems. We recommend that the WA Liveable Neighbourhoods document explicitly articulates the vision and strategic objectives for water sensitive neighbourhoods to ensure that urban water management is given due prominence within the urban planning and design processes. It would be helpful to include best-practice case studies.

The concepts and recommendations in this submission place greater emphasis on a 'water sensitive' approach to planning and design. This requires a focus on Water Sensitive Urban Design (WSUD). WSUD is a contemporary approach to the planning and design of urban environments that focuses on integrating the urban water cycle (including potable water, wastewater and stormwater) into the built and natural urban landscape to provide multiple benefits to society. WSUD has evolved from its early association with stormwater management to provide a broader framework for sustainable urban water management. It is linked to Ecologically Sustainable Development (ESD) and Integrated Water Cycle Management (IWCM), with a focus on sustainable management of urban water resources and environmental protection. It is recommended that the WA Liveable Neighbourhoods document incorporate WSUD principles and other 'water sensitive' approaches to provide a greater emphasis on multi-functional landscapes and ensure the environmental functions and services that underpin place-making are not compromised.

Contemporary urban water management practices can have a significant influence on the quality of public spaces, the promotion of efficient and low energy urban infrastructure and the establishment of productive urban landscapes. Integrated water management plays an important role in underpinning the vitality and prosperity of Perth through:

- the provision of safe, secure, affordable water supplies;
- supporting green landscapes that significantly enhance urban amenity and help to combat the impacts of the urban heat island effect;
- improving the health of surface water and groundwater systems ;
- providing opportunities for active and passive recreation; and
- flood protection.

This summary documents the key findings from the review of the Draft WA Liveable Neighbourhoods 2015 undertaken by the CRC for Water Sensitive Cities. Suggestions and comments regarding key aspects of the content are described below.

General comments

Themes	
Integrated land and water planning	Water in the urban environment directly contributes to the liveability of a city. It is a critical aspect of place making, both in terms of environmental values, social amenity and cultural connection to a place. Water and land planning need to be better integrated to address the gap between policy and implementation. Early consideration of land planning needs to consider both local and regional objectives and priorities for water planning to ensure elements of the urban water system function together at a range of scales across the entire water cycle (supply, sanitation, flood protection, pollution reduction and landscape amenity). It should be coordinated to deliver multiple beneficial outcomes for the community (including, water security, flood risk, biodiversity, public green spaces, healthy waterways and ground water systems and connected communities). This can only be achieved if planning provides a greater focus on urban water planning. The WA Liveable Neighbourhood document introduces water planning considerations but the focus is very high level and is largely dealt with through a *Drainage and Water Management Plan, District Water Management Strategy, and/or Local Water Management Strategy*. Examples should be provided to demonstrate the type of land use considerations that are important early in the planning process to ensure opportunities for integration at different scales (such as, within streetscapes and public open spaces) and co-location of assets (such as, stormwater management measures with amenity and recreational assets) are identified. A lack of early consideration of water planning in urban design results in suboptimal outcomes.
Groundwater and infiltration practices	Much of the groundwater has naturally high nutrient concentrations. There is general consensus that these are so-called “legacy” nutrients due to the low lying areas of the Swan Coastal Plain being predominantly wetland systems that intercept groundwater. This intersection between the ancient wetland systems and superficial groundwater means than organic nutrients from the wetland leach down into the groundwater. Research undertaken by the University of WA is monitoring the flows and conveyance of nitrogen and phosphorus to the groundwater system which in turn can flow into rivers and lakes (thereby increasing the potential for excessive algal growth in these systems). Mapping the depth to water-table across the Perth metropolitan and Peel region has shown it to vary significantly, ranging from greater than 10 m, to less than 1 m. In light of the regions unique groundwater system, managing runoff at source using infiltration practices needs to be tailored to the local context. The document needs to be explicit on; • areas conducive to infiltration practices (for example, in areas with deep groundwater systems as the sands provide a significant barrier to the movement of nutrients to the groundwater), and

	• areas where infiltration should be avoided because water tables are close to ground surface (for example in areas where development requires sub-surface drainage) or managed using vegetated stormwater infiltration systems to improve water quality prior to infiltration. This approach facilitates 'distributed' infiltration of small rainfall event runoff in sandy soil areas with 'treatment' achieved through the vegetation interception and soil filtration of rainfall runoff through to the fully saturated zone. Other stormwater retention and use systems, such as rainwater tanks, may be an appropriate response, to assist in the management of the increase in infiltration volume in urban areas. Particular attention should be given to calculating the post-development water balance in areas with significant interactions between groundwater and surface water (such as, where groundwater dependent ecosystems are located) to ensure catchment urbanisation and stormwater management measures protect the groundwater dependent ecosystems, and also prevent groundwater flooding.
Source control	More guidance is needed on the relationship between lot layout and building design for climatically responsive outcomes. Little recognition is given to the importance of maintaining pervious surfaces and designing urban developments with disconnected impervious surfaces in order to reduce impacts associated with excess stormwater flow and pollutants (beyond minimising impervious areas stated on pg 22). A description explaining why pervious areas are important (especially in regards to on lot) would be beneficial. The inclusion of best-practice example would assist.
Multi-functional assets/hybrid systems	Section 5 poorly articulates the opportunity for the co-location of stormwater management measures with other assets in public open spaces to deliver multiple beneficial outcomes for the community. As a result developers have tended to minimise the land-take of infiltration basins by maximizing their depth. This has resulted in a poor urban design and landscape outcome with unattractive basins having to be fenced within residential estates (refer to example below). The statement on Pg 61 'Design approaches for amenity should be separated from design approaches for flood protection' could continue to result in poor urban design outcomes and conflicts with the design of multifunctional stormwater management measures to deliver multiple benefits.

	 Precinct scale opportunities are particularly important in areas where stormwater management measures implemented on-lot and streetscapes are constrained (such as, med to high density development with small lots). Maitland Park provides a good example of flood mitigation that is integrated with the landscape to provide recreational value as well as flood storage. It is recommended that the document include an example of how these measures can be incorporated into Public Open Space. Research being undertaken by the CRCWSC is reinforcing multifunctional management measures and focusing on innovation through the integration between WSUD and resilience concepts. Dealing with flooding and drought using hybrid systems can simultaneously optimise and maximise the many benefits that may accrue due to the co-management of water and urban environments (Rodriguez et al., 2014). Examples relevant for Perth include hybrid systems that provide an infiltration function during rainfall events, harvesting and storing groundwater during wetter periods for use as an irrigation supply for the landscaping and amenity values during drier months. Similar concepts are used in practice elsewhere in the world (for example, Zinger et al., 2011). REF: Rodriguez, C. N. A. S., Ashley, R., Gersonius, B., Rijke, J., Pathirana, A. and Zevenbergen, C. (2014) Incorporation and application of resilience in the context of water-sensitive urban design: linking European and Australian perspectives. Water, 1, 173–186. REF: Zinger, Y., A. Deletic, T. D. Fletcher, P. Breen and T. Wong (2011). A Dual-mode Biofilter System: Case Study in Kfar Sava, Israel. 12th International Conference on Urban Drainage. Porto Alegre, Brazil.
Alternative water supplies	In many places, the use of treated wastewater is a critical water source for irrigating supply. The Water Corporation is guided by the Department of Health and Department for Environment Regulation licences/approval for wastewater irrigation proposals, to ensure the protection of human health.

	Protecting receiving waters from excessive nutrients needs further guidance. As long as there is a large separation distance to the water table to provide ample opportunity for treatment as water percolates through the soil profile the inorganic nutrient attenuation is expected to be high. This would be similarly applicable to the reuse of stormwater. Some guidance is provided by the Guidelines for the Non-potable Uses of Recycled Water in Western Australia (DoH 2011). Industry draws on the Department of Water's Water Quality Protection Note 22 "Irrigation with nutrient rich wastewater" to guide nitrogen and phosphorus application rates using Tables 1&2 of the note. Additional treatment for the removal of nutrients from alternative water supplies may be required in areas where the water tables are close to ground surface (for example in areas where development requires sub-surface drainage).
Street trees	The urban heat island effect is now well demonstrated. Heatwaves are predicted to increase in frequency, duration and intensity around Australia in the coming decades. Increases in the number of 'hot' days above current mortality-heat thresholds are also expected. Street trees supported by design principles such as keeping water in the landscape and promoting well-irrigated vegetation can provide microclimate benefits by reducing excess urban heating (through shading), and cooling (by evapotranspiration) and limit human exposure to extreme heat. Greater focus on landscape quality (including provision of shade trees) which would allow reduction of front setbacks. A combination is required here – requirement for better designed street verges, together with better designed, more useable and environmentally considered private space. Emphasis should be placed on promoting street tree designs that enable passive watering of the trees to improve tree health, reduce leaf litter and maximise canopy cover. Research being undertaken by the CRCWSC is reinforcing the microclimate benefits of landscaped stormwater management measures in urban environments. Daytime shading provided by healthy street tree canopies can improve human thermal comfort at the street scale by significantly reducing mean radiant temperatures (a measure of the influence of radiative energy on the body). Urban street tree monitoring has shown on average, mean radiant temperatures were up to 18°C lower at midday where there was tree canopy shading, demonstrating the capacity for considerable improvements to human thermal comfort from healthy tree canopy shading. Encourage the narrowing of major and other road widths so that they are capable of being shaded by verge trees and their heat island effect reduced - i.e., reduce the emphasis on traffic engineering and increase the emphasis on environmental quality and pedestrian experience. From a stormwater management perspective non-deciduous trees that are irrigated over the summer months are encouraged to minimise leaf drop. From an UHI perspective there may be reasons to allow for greater flexibility regarding tree choice.

	REF: Urban intensification and green infrastructure. Design guidelines for WSUD precincts with integration demonstrated at different scales Project D5.1. REF: Framework for the implementation of WSUD and urban greening for improved urban climate Project D5.1
Consistency in terminology	Improve consistency in terminology. For example, The term drainage doesn't reflect alternative approaches to managing urban runoff. Replace the term stormwater 'drainage' with stormwater 'management' Stormwater management techniques, vegetated stormwater management infrastructure, water sensitive urban design techniques, water sensitive urban design features, are all referring to the same thing. Replace with 'stormwater management measures' and vegetated stormwater management measures when needing to be specific (such as when discussed in regards to mitigating urban warming). Water sensitive urban design principles is OK and should be kept.

Specific comments

Principal Objectives	
Objective 5	Public open space provides a significant opportunity to address multiple issues and should be designed for both functionality and amenity. Objective 5 is vague and doesn't encourage future innovation in design of these spaces to improve outcomes for the environment, thermal comfort, health and well-being, flood management and stormwater management at the precinct scale, etc. Suggested rewording: 'Plan for multi-functional public open spaces that meets the recreational, environmental, and social and health needs of existing and future communities.'
Objective 6	This objective is not clearly worded. Separate into two objectives directed at; 1) retaining natural drainage/ landscape features and 2) protecting surface water and groundwater systems Suggested wording: 'Retain natural drainage systems and ensure that surface water and groundwater systems (including drinking water recharge areas) are protected and managed through the incorporation of water sensitive landscapes in urban areas.' 'Ensure water infrastructure and planning are co-ordinated to protect and enhance water resources.'
Objective 12	Replace the term stormwater 'drainage' with stormwater 'management'. This term should be used consistently throughout the document.
Element 1	
Pg. 13	Site and context analysis requirements 1.2 Include 'groundwater dependant ecosystems' in the list of significant environmental assets.

Pg. 22-23	There is a risk that water planning and land use planning will remain separate for too long and fail to deliver the best outcome for the community. Site context, depth to groundwater table, land use, and lot-density all influence the appropriate mix of scales and measures. This should be acknowledged in this section even if the bulk of the water system planning is through a *Drainage and Water Management Plan, District Water Management Strategy, and/or Local Water Management Strategy* as some measures and assets will influence certain layout requirements, as well other urban design and landscape features. This section would greatly benefit from an example of integrating stormwater management at different scales to ensure the appropriate balance between on lot, streetscape and precinct scale opportunities are identified early in the planning process. This example should highlight the multiple benefits achieved by adopting this type of approach. Pg22. The dot points are vague and should be replaced with more specific and meaningful considerations of the WSUD principles. As they have been sourced from a local reference they could be listed as modified after the Stormwater Management Manual for Western Australia and Better Urban Water Management. Suggested changes: • The first principle should read 'Protect and enhance groundwater and surface water systems and their hydrologic regimes in urban developments' (rather than '*natural water systems'*). • The third principle should read 'Protect water quality from urban development by designing both the urban footprint and associated treatment systems to minimise the conveyance of pollutants to surface water and groundwater systems'. • The fourth principle *'Manage runoff and reduce peak flows from urban development by using local retention measures and minimising impervious areas.'* This should be replace with two principles. The first should read 'maintain pervious areas throughout the development.' The second should read 'manage runoff and reduce peak flows from urban development by using local retention measures, where appropriate.' *Pg 22. 'The connection into the regional drainage system is to be addressed by proponents through a Drainage and Water Management Plan, District Water Management Strategy, and/or Local Water Management Strategy. These are required and approved simultaneously at the relevant structure planning stage or subdivision.'* Following reference to the regional drainage scheme the document should list the important stormwater management considerations to be aware of at this stage in the planning process. For example, flood resilience, how connections between different stormwater management measures occurs at different scales, and the interactions between floodplains, retention assets and overland flow paths. Department of Planning should seek further advice from the Department of Water on this. Pg 23 Dot point three under water use efficiency 'promoting the re-use of recycling of wastewater' should be broadened to alternative water supplies (including rainwater,

	stormwater, greywater and wastewater). If alternative water supplies have high nutrient concentrations, use outdoors as an irrigation supply should be avoided in areas with significant surface water - groundwater interactions. Pg 23 Urban water management requirement 6.6. This should not be limited to streetscape. It should also refer to public open space.
Element 2	
Pg 60-62	Pg 60 Design Principle 3 replace stormwater 'drainage' with stormwater 'management' and anywhere else it is relevant in the text. Pg 60 paragraph 2: street verge widths need to demonstrate they can accommodate 'stormwater management measures' as well as the other items included in the sentence. Pg 61 Street trees section; add another sentence at the end 'Where possible promote passive irrigation of street trees through directing road runoff to the tree base to improve tree health and maximise the beneficial functions associated with a larger tree canopy.' Pg 61 Street stormwater management. Delete first dot point as it conflicts with promoting multifunctional public open spaces and principles of co-location of assets. Add a few new dot points. Suggested rewording below. Incorporating stormwater management measures into the street network where possible, can: • improve tree health and amenity value; • provide a holistic approach to managing urban runoff, complementing measures located on-lot or in public open spaces; • minimise disturbance to existing landform, natural waterways and native vegetation; • reduce downstream stormwater runoff peak flow rates and volumes; and • reduce pollutants conveyed to receiving water bodies. Pg 61 Delete last paragraph. 'Design approaches for amenity should be separated from design approaches for flood protection' as this conflicts with incorporating multifunctional stormwater management measures. Pg 61. Verge design requirements 3.1, include stormwater management measures.
Element 4	
Pg. 75	Replace 'vegetated stormwater management infrastructure' with 'vegetated stormwater management measures'.
Pg. 87	Non-drinking water supply: 1st paragraph. Add additional sentence 'For example, avoid the use of an alternative water supply that has high phosphorus or nitrogen concentrations for outdoor uses in areas with significant interactions with groundwater dependant ecosystems.' Utility service provision requirements. Replace 'rainwater' runoff with 'stormwater' runoff.

Element 5	
Pg, 90	Introduce a new section on co-location of assets that emphasises the approach and importance of multifunctional spaces and co-location of assets. Refer to notes in general comments section. A good example is located at Maitland Park. It would good to use such as example of how these measures could be designed.
Pg. 96-98	Pg. 97 Integrated Water Management. Remove ' where there is a lack of available water' from the sentence as they should apply everywhere The following consideration should apply to public open spaces: Figure 37 should be replaced with an example of a multifunctional public open space through co-locating flood detention and stormwater management measures, recreational spaces and bushland retention.' Pg. 98 Development of open space requirements 8.7 delete wording 'to ensure it does not compromise the public open space function'. Areas that are designed to be multifunctional will be designed that their others uses may be impeded for a short period of time after a storm event. Pg. 98 Development of open space requirements 8.8 should read 'Constructed stormwater treatment measures to be designed in accordance with water sensitive urban design principles and approved in the Local Water Management Strategy and Urban Water Management Plan. This is because ornamental lakes do not provide a treatment function and therefore should be considered a receiving water body with inflows treated to protect its water quality.'
Pg. 109	Public open space provision requirements 9.11. Delete this requirement as it conflicts with the concept of multifunctional public open spaces and co-location of assets.