IWM case study 4

SALISBURY INFILL DEVELOPMENT, ADELAIDE

Project description

The *IWM Principles and Best Practice for Water Utilities* paper describes how options for delivering IWM outcomes can be achieved by non-structural means (achieving outcomes through policy or regulatory instruments – eg. pricing, water conservation, off-sets, or land use planning and urban design regulations).

Pricing and water conservation programs are often used as non-structural responses to IWM challenges and the use of offsets has been used on occasions (**see Case Study 6 – Kilmore Treatment Plant Offsets Scheme**), but the Salisbury Project is a unique attempt by the CRC for Water Sensitive Cities to examine the impacts of differing infill development designs (and planning guidelines) on factors that have a direct impact on outcomes related to the resilience and liveability of urban developments. The outcome factors examined are altered hydrology, urban heat, and urban amenity.

The site chosen for the research is a 130 ha precinct on the eastern perimeter of the Salisbury city centre, in the northern Adelaide suburbs. In 2019 a population of approximately 1,900 was supported with a net density of 16 dwellings/ha.

A number of different planning scenarios were tested. The BAU future planning and design option is assumed to support 5,000 people. However, a maximised water sensitive intervention is designed in a way that would support a population of 11,000 without adversely altering current hydrological balance. Along with residential transformation, roads and verges are redeveloped in each development scenario.

The Salisbury analysis is guided by the CRC WSC IRP4 project's Infill Performance Evaluation Framework[1]. The final framework, case study and project report is expected to be publicly available in late 2020. Ultimately, the work is expected to contribute to improved infill governance.

Project drivers

Most major cities in Australia expect significant infill development over the coming decades. Without significant intervention, 'business as usual' planning and design approaches will have a considerable influence on the hydrology, resources efficiency, liveability and amenity of our cities. The Salisbury Project aims to develop and apply a performance framework to understand impacts of urban infill development, create design options and processes through case studies, and identify improved governance options and arrangements.

[1] https://watersensitivecities.org.au/content/project-irp4/

Stakeholder and community engagement

The research project is being undertaken by the CRC for Water Sensitive Cities in collaboration with:

- Salisbury City Council
- Salisbury Water[2]
- Water Sensitive SA

Outcomes sought

The critical IWM Outcomes desired for this project are:

- **Outcome 3a** – Policy, legislation and regulations
- **Outcome 3b** – Water a key element in urban infrastructure planning and design
- **Outcome 7a** – Activating connected green – blue space
- **Outcome 7b** – Infrastructure elements functioning as part of the urban water system
- **Outcome 7c** – Urban heat mitigation

Options assessed

The project has developed a model for systematically quantifying the performance of urban developments across a range of performance indicators:

- Hydrology;
- Water resource management;
- Urban heat; and
- Architectural and urban space quality.

The study compared the performance of business-as-usual and water sensitive infill development scenarios against the existing state, to explore:

- Changes in land use and imperviousness;
- Changes in hydrology (stormwater runoff, infiltration and evapotranspiration);
- The degree of water self-sufficiency that can be achieved; and
- Changes in urban heat, which is an important factor in the hot Adelaide context.

[2] Salisbury Water is the term used for Salisbury Council's recycled non-drinking water that is distributed to parks, reserves, schools, industry and some new residential sub-divisions. Salisbury Water is primarily recycled water and native groundwater which is treated to a fit for purpose standard.

Discussion

The Salisbury Project's precinct is very typical of the scattered lot-scale densification occurring in many cities in Australia. The evaluation has found that smarter water sensitive dwelling designs and green streets makes it possible to increase dwelling densities without adversely altering current hydrological balance. The smarter designs use two-storey instead of single-storey designs to free up valuable pervious surfaces, use permeable paving, and make space for deep rooted trees.

Having supplementary water to support dense tree canopies was a very important ingredient. So significantly more water storage capacity in the urban landscape is crucial, which Salisbury has in its large Aquifer Storage and Recovery (ASR) scheme. The right water pricing could make this valuable water more viable for greening and cooling this densifying precinct.

The project builds on previous CRC WSC research that developed an urban metabolism, documented best practice water sensitive urban design and identified the cooling effects of water sensitive practices in urban renewal works.

The project will also utilise a range of existing CRC WSC tools and products such as the WSC Toolkit and the WSC Index.

The project principally focuses on developments from individual lots through to the precinct scale. To achieve its objectives, the project will work closely with the CRC WSC Tools and Products (TAP) program.

Image: Edinburgh, City of Salisbury and a Salisbury City Council sign for recycled water. Source: Salisbury City Council

Evaluation and financing

The project team collaborated closely with urban planners and water practitioners in the case study region to better understand the local context, needs and the aspirations of the

community in the study area. The process of application of the Evaluation Framework incorporates the following steps:

a. Site-plans were created for dwelling and street typologies for the chosen in-fill design scenarios. Site-specific parameters related to architectural design and water were defined.

b. The typologies created were expanded to the full 130ha precinct to represent the three scenarios to produce the precinct plan. It also involves the definition of water servicing assumptions.

c. The site and the precinct plans developed were evaluated in terms of urban water flows, urban heat and the architectural and urban space quality using the Evaluation Framework against several performance principles.

d. Finally, performance indicators were generated from the Evaluation Framework to understand the overall performance of the water-sensitive design scenarios against others. The indicators are compared with the context-specific targets where available.

e. Water performance was assessed at precinct-scale using daily water balance with “Aquacycle”. Urban heat was evaluated using Urban Multi-scale Environmental Predictor (UMEP) model.

Conclusions

This case study demonstrates that the water-related impacts of infill development are significant and the benefits of good design can be substantial. Alternative and water sensitive designs can lead to considerable influence on runoff, infiltration, evapotranspiration, urban heat and other changes improving liveability, resilience and water security.

This case study demonstrated it is possible to provide housing for additional (beyond target) population growth, and simultaneously mitigate existing previous negative consequences of relatively unplanned (hydrologically) development, an important outcome to be able to engage land use planners and state planning departments concerned with providing housing to meet growth.

A range of design variables was observed to have strong influence on hydrological outcomes. For example, the overall pervious/impervious fraction, coupled with on-site water storage, and degree of local use of water, had substantial influence on most outcomes such as stormwater runoff, infiltration and evapotranspiration.

The work also provides a significant foundation from which a more quantified business case for water sensitive outcomes can be achieved from new development designs and typologies. As example, the impact on water supply, wastewater flow, flooding, building costs, air-conditioning could be quantified from the designs presented in this case study.