

WGV Waterwise Development Exemplar



Final Report

October 2020

This report provides the final summary of activities undertaken as part of the five year WGV Waterwise Development Exemplar program.

Previous updates include:

- WGV Waterwise Development Exemplar - 2018/2019 Partner Update
- WGV Waterwise Development Exemplar - 2017/2018 Partner Update
- WGV Waterwise Development Exemplar - 2016/2017 Partner Update
- WGV Waterwise Development Exemplar - 2015/2016 Partner Update

The WGV WDE has been made possible through the continued support of the following partners.



Government of **Western Australia**
Department of **Water and Environmental Regulation**



CRC for
Water Sensitive Cities



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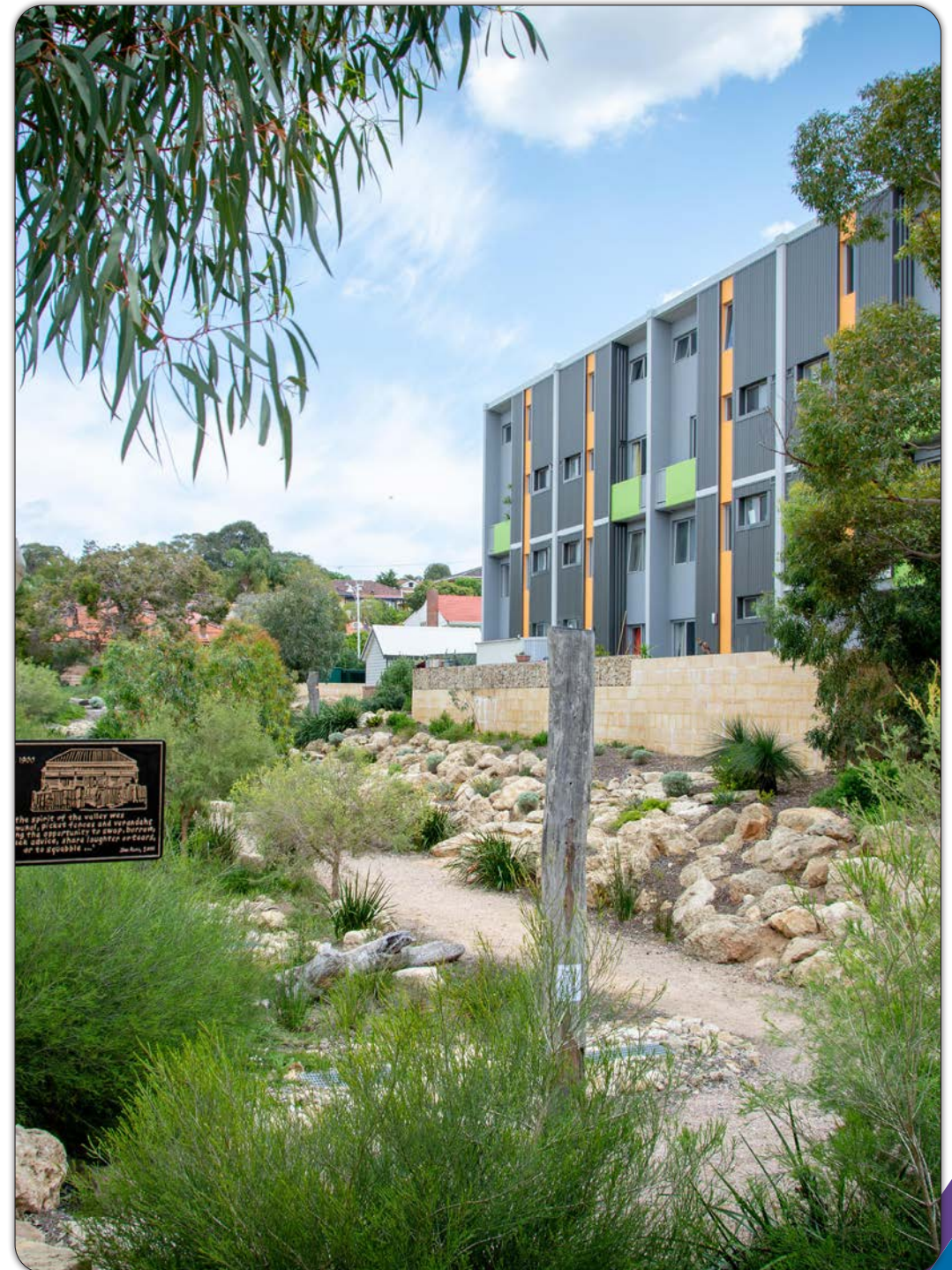
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WGV - A Waterwise Development

WGV is a 2.2ha infill development in the Fremantle suburb of White Gum Valley. The DevelopmentWA 'Innovation through Demonstration' project showcases precinct-scale design excellence by incorporating a range of diverse building types, climate sensitive considerations, low carbon energy initiatives, creative urban greening and leading-edge water management strategies.

The Waterwise Development Exemplar

The WGV Waterwise Development Exemplar (WDE) is a collaborative program aimed at showcasing industry leading approaches to urban water management and mains water optimisation. WGV targeted a 60% - 70% reduction in mains water consumption across a suite of initiatives, which equates to 30kl - 40kl per person per year, in contrast to the Perth average of 106kl per person per year.*

The water and energy innovations at WGV were captured via a series of research programs in cooperation with a variety of research partners including Curtin University, the Cooperative Research Centre (CRC) for Low Carbon Living, CRC for Water Sensitive Cities and ARENA with the results widely published in academic literature (see Section 5).

WGV is a Water Corporation endorsed Gold Waterwise Development and a global leader in One Planet Living**.



Water saving initiatives

WGV incorporates a suite of water saving initiatives across the various building types that take into account a range of factors such as cost, maintenance, sustainability and economies of scale.

Density Savings

'Embedded' water efficiency gains are expected from increased development density when compared to the historical Perth average*.

Indoor Water Efficiency

Inclusion of minimum specified water efficient fixtures (9 L/minute, 3 stars WELS rating) for all new dwellings under the National Construction Code (NCC).

Indoor Water Efficiency +

Additional efficiency gains achieved via enhanced water efficient fixtures and appliances over and above the NCC requirements included in the development Design Guidelines (DGs).



Landscape Efficiency

Mandated installation of water efficient irrigation with a rain sensor and programmable controller connected to the meter. Recommended adoption of hydrozoning principles, irrigation controls such as evapotranspiration sensors or soil moisture sensors, and the creation of microswales and basins to reduce runoff and recharge soil moisture.

Behaviour Change

Resident education and support initiatives have been integrated with the One Planet Living Action Plan.

Smart Metering

Real-time data logging will provide leak detection and feedback to users to support efficient water-use behaviour.

Rainwater Harvesting

The supply and installation of a 3,000L rainwater tank, pump and mains water back up is available as part of a sustainability package for detached dwellings. DGs mandate dual plumbing to toilets and washing machines, provision of sufficient space for a rainwater tank and roof catchment area.

Community Bore (Groundwater)

Groundwater from the superficial aquifer is supplied via a centrally controlled third pipe (purple pipe) system. DGs stipulate that irrigation controllers and individual meters be installed for optimal efficiency.

Partner Update

The WGV project is nearing completion and the majority of lots have now been built out. Remaining construction work at WGV includes several detached dwellings and one multi-residential site held back for an experimental European development approach known as 'baugruppe'.

Figure 1 illustrates how remote monitoring equipment was installed throughout the estate to gather data via a combination of building level data loggers for the multi-residential buildings and battery operated data loggers for the detached dwellings and field sensors.

Table 1 summarises the mains water data connection points, meaning that in each case equipment is installed, commissioned and is sending data.

Remote readings were verified by manual readings for an extended period that is now complete. Data from all active data points is being sent automatically to a database administered by the Curtin Institute for Computation (CIC) to enable access by researchers.

Equipment for remote monitoring of water levels is installed and operational on the shared bore and on the infiltration system at the sump site. This is on City land on the southwest corner of WGV. The sump site was converted into to a public pocket park in a collaboration between DevelopmentWA and the City. Monitoring of bore water consumption for irrigation of public green spaces is now the responsibility of the City who manage the bore and public realm irrigation infrastructure.

The remote monitoring network has been producing data at some sites for over 3 years, while others have come online over the last year. Water Corporation are covering the licence costs for the battery operated remote data loggers until June 30 2021. The building level data loggers installed at the multi-residential sites will continue to be operated by the respective building managers.

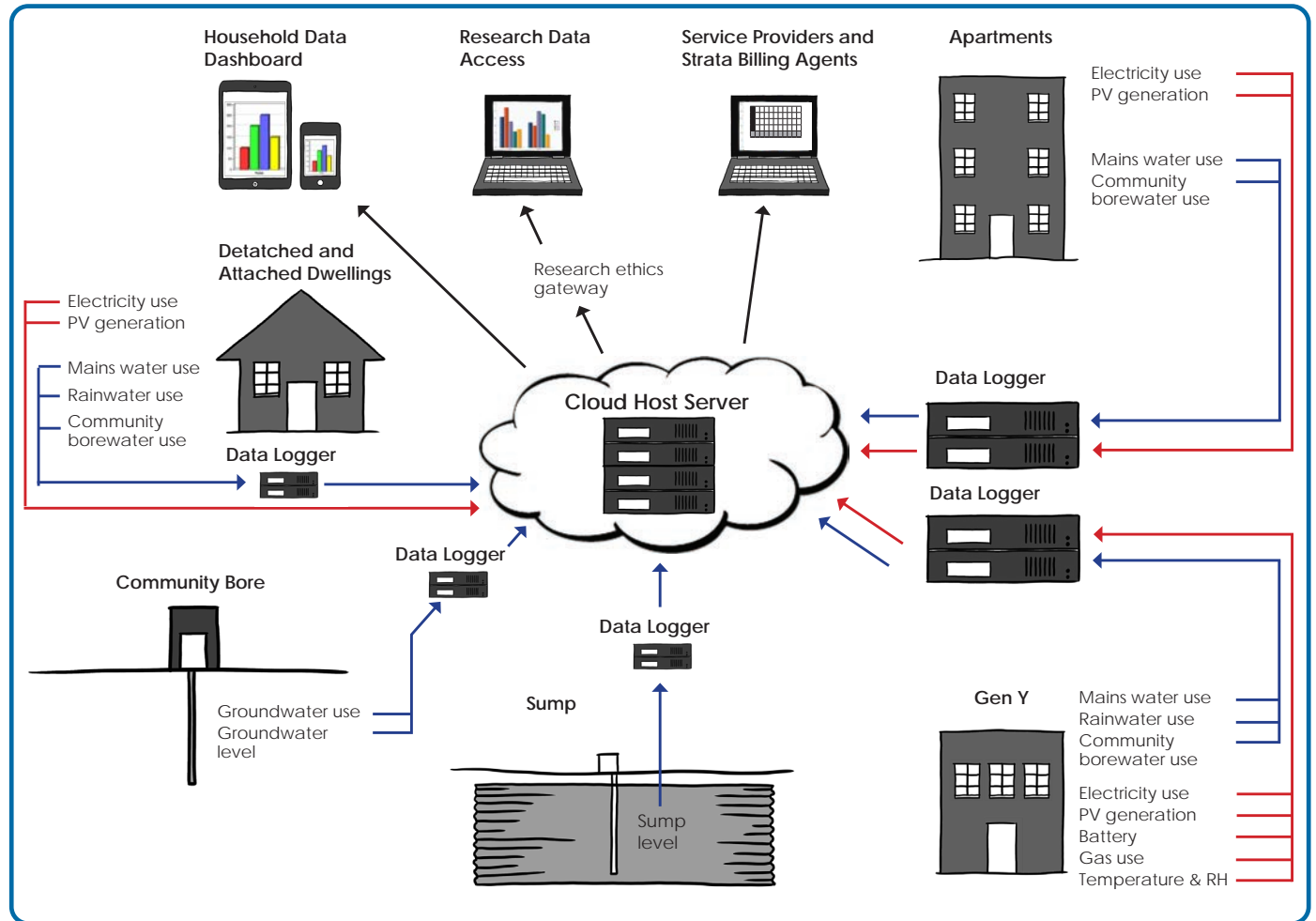


Figure 1 - WGV precinct monitoring architecture

Table 1: Mains water data gathering points at WGV

WGV typologies	Mains water meters - data connections installed to main meters	Mains water - data connections installed to sub-meters
Detached dwellings	18	NA
Attached dwellings	1	0
Apartments	3	39

Water Savings

The data analysed indicates that WGV residents are consuming mains water at 37kL per person per year as a weighted average, only 1kL more than the target set in 2015.

This is a 65% reduction in mains water consumption compared to the Perth average*.

Further data analysis is presented in the academic paper:

WGV: Quantifying Mains Water Savings in a Medium Density Infill Residential Development

<https://www.mdpi.com/2071-1050/12/16/6483>

Table 2 shows the residential water consumption at WGV grouped by housing typology while Figure 2 shows residential water use for all water sources grouped by housing typology.

Table 2 - WGV Mains Water Use

TPOLOGY	Mains water use [kL/person/year]	Weighted average mains water use [kL/person/year]	Achieved reduction
Detached Dwellings	52kL	37kL	65%
Attached Dwellings	28kL		
Apartments	27kL		

*Perth average of 106kL per person per year. 2008/2009 PRWUS.

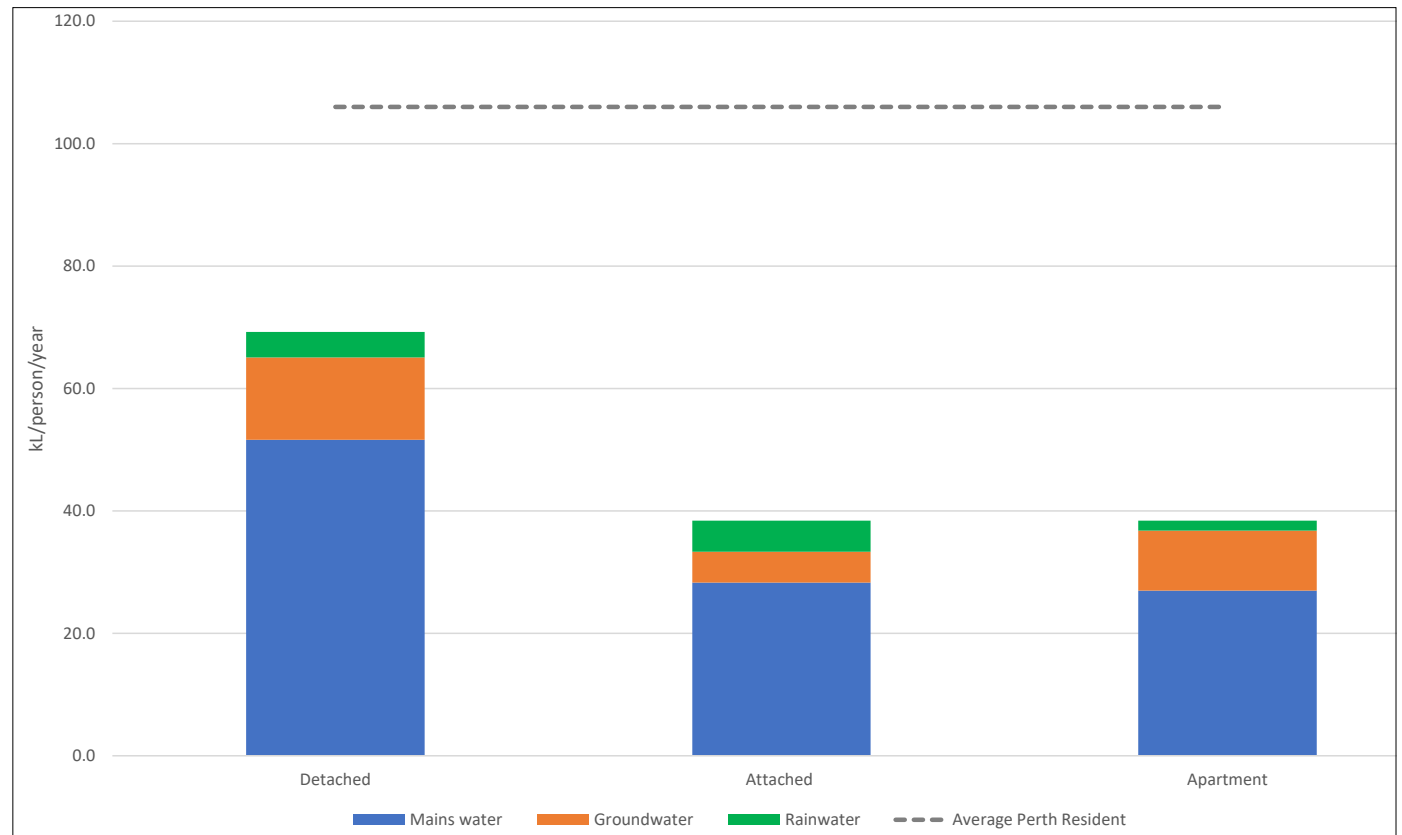


Figure 2 - WGV Residential Water Use

Table 3 shows the overall water consumption by WGV residents for all available water sources.

Table 3 - WGV Total Water Use

TPOLOGY	Mains water use [kL/person/year]	Borewater use [kL/person/year]	Rainwater use [kL/person/year]	Total water use [kL/person/year]	Total water use reduction on average Perth resident*
Detached Dwellings	52kL	13kL	4kL	69kL	35%
Attached Dwellings	28kL	5kL	5kL	38kL	64%
Apartments	27kL	10kL	2kL	38kL	64%
Precinct Weighted Average	37kL	11kL	3kL	51kL	52%

Observations by Housing Type



Detached dwellings

Mains water consumption averages 52 kL/person/year, which is a 51% reduction compared to the Perth average. Bore use for garden irrigation averages 13 kL/person/year and rainwater (supplies toilets and washing machines when available) averages 4 kL/person/year.



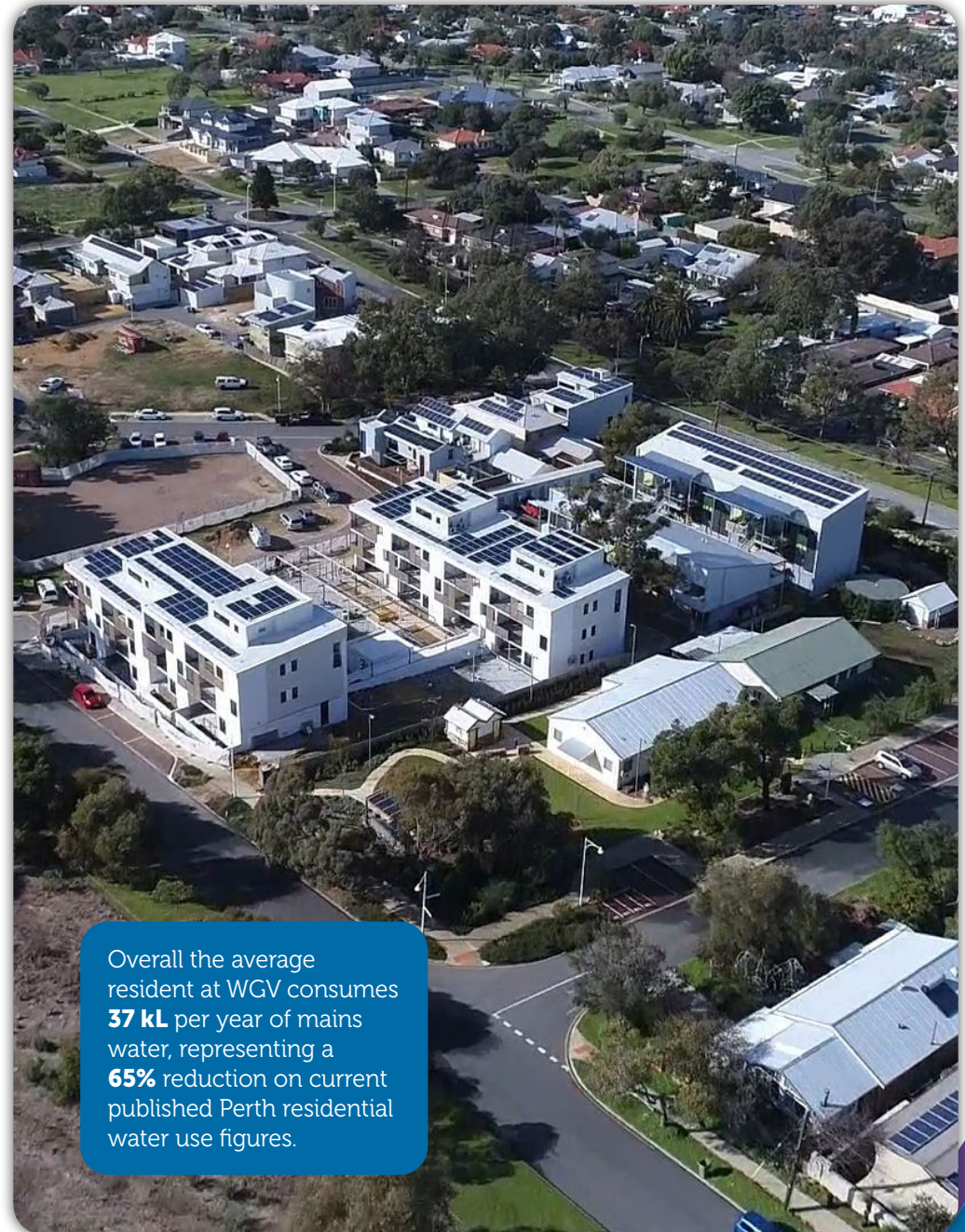
Attached dwellings

Mains water consumption averages 28 kL/person/year, which is a 73% reduction to the Perth average. Bore use for garden irrigation is 5 kL/person/year, and rainwater is also 5 kL/person per year.



Apartments

Mains water consumption averages 27 kL/person/year, which is a 75% reduction to the Perth average. Bore water consumption averages 10kL/person/year. Rainwater is rarely used in apartment buildings in Perth. At WGV, of the multi-residential developments only the GenY House, a strata typology with three apartments on a small footprint, has a rainwater connection. GenY residents use on average 5 kL/person/year of rainwater, which is 12% of their total consumption. Once averaged across all apartments the impact of rainwater is greatly reduced.

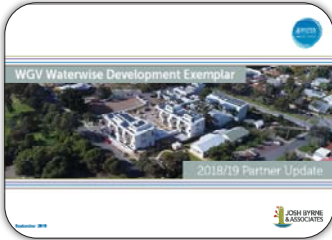
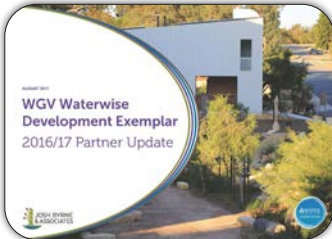


Overall the average resident at WGV consumes **37 kL** per year of mains water, representing a **65%** reduction on current published Perth residential water use figures.

Communication & Engagement

The WGV Waterwise Development Exemplar 'Community Engagement Strategy' was supported and delivered by stakeholders, fostering interest in the project and driving its success.

There were a considerable number of quality communication outcomes over the life of the project, with key items and achievements documented in detail in the annual Partner Updates.



A brief summary of communication outputs includes:

- 50 x keynote presentations, lectures, master classes and panel discussions
- 24 x major site tours, including two ministerial tours
- 15 x events, workshops, seminars or exhibitions
- 10 x videos
- 7 x industry awards
- 12 x major publications, including book chapters, reports and industry guides
- 4 x radio and TV appearances
- 6 x academic research papers
- 1 x website – www.densitybydesign.com.au/wgv



What's Ahead

Now that modelling and targets are being replaced by real world data, the water initiatives being demonstrated at WGV have a new immediacy and the data can be used in a number of ways.

Outreach

A communications plan is in place for a new phase of industry engagement based on taking what has worked and lessons learned along the way. Being able to discuss dramatic actual reductions in mains water consumption changes the dynamic compared to a discussion of targets and intentions and is expected drive strong interest from developers and policy makers alike.

Research

Water system data from WGV is now available to researchers through a database administered by the Curtin Institute for Computation (CIC). There are PhD candidates and post-doctoral researchers now looking at this data and using their analysis for a range of research projects.

DevelopmentWA Projects

There are DevelopmentWA projects that can be considered direct descendants of WGV, including East Village at Knutsford, in Fremantle, and OneOneFive Hamilton Hill. These residential infill projects have utilised the learnings from WGV and are acting as new platforms for research, demonstration and industry engagement.

East Village at Knutsford

DevelopmentWA's East Village at Knutsford represents an evolution in the delivery of state-of-the-art sustainable housing with efficient design, innovative servicing and local identity at its core.

Including 60 apartments and 36 architecturally designed town homes, the site will join WGV as part of a network of sustainable communities demonstrating how to plan and deliver water sensitive urban developments.

The project is targeting 80% reduction in mains water consumption*. It is home to several research projects including the Curtin University Legacy Living Laboratory (L3) national iHUB project and the CRC for Water Sensitive Cities' Water Sensitive Outcomes for Infill Developments' research.

OneOneFive Hamilton Hill

OneOneFive Hamilton Hill, located on the former Hamilton Senior High School site, is a DevelopmentWA demonstration residential infill project targeting the highest level of sustainability.

The new residential community has the potential for 225 lots and 333 homes, together with quality public open space.

OneOneFive is targeting a 70% reduction in mains water consumption* through a balanced approach to water use by combining water efficiency and alternative water supply options to support green spaces and community wellbeing.

The OneOneFive Hamilton Hill Waterwise Exemplar (WE) will investigate, document and communicate how integrated water management approaches at the development can become mainstream practice in Perth's urban development industry. The WE is supported by the Water Corporation and DevelopmentWA, City of Cockburn and Department of Water and Environmental Regulation.

*PRWUS



