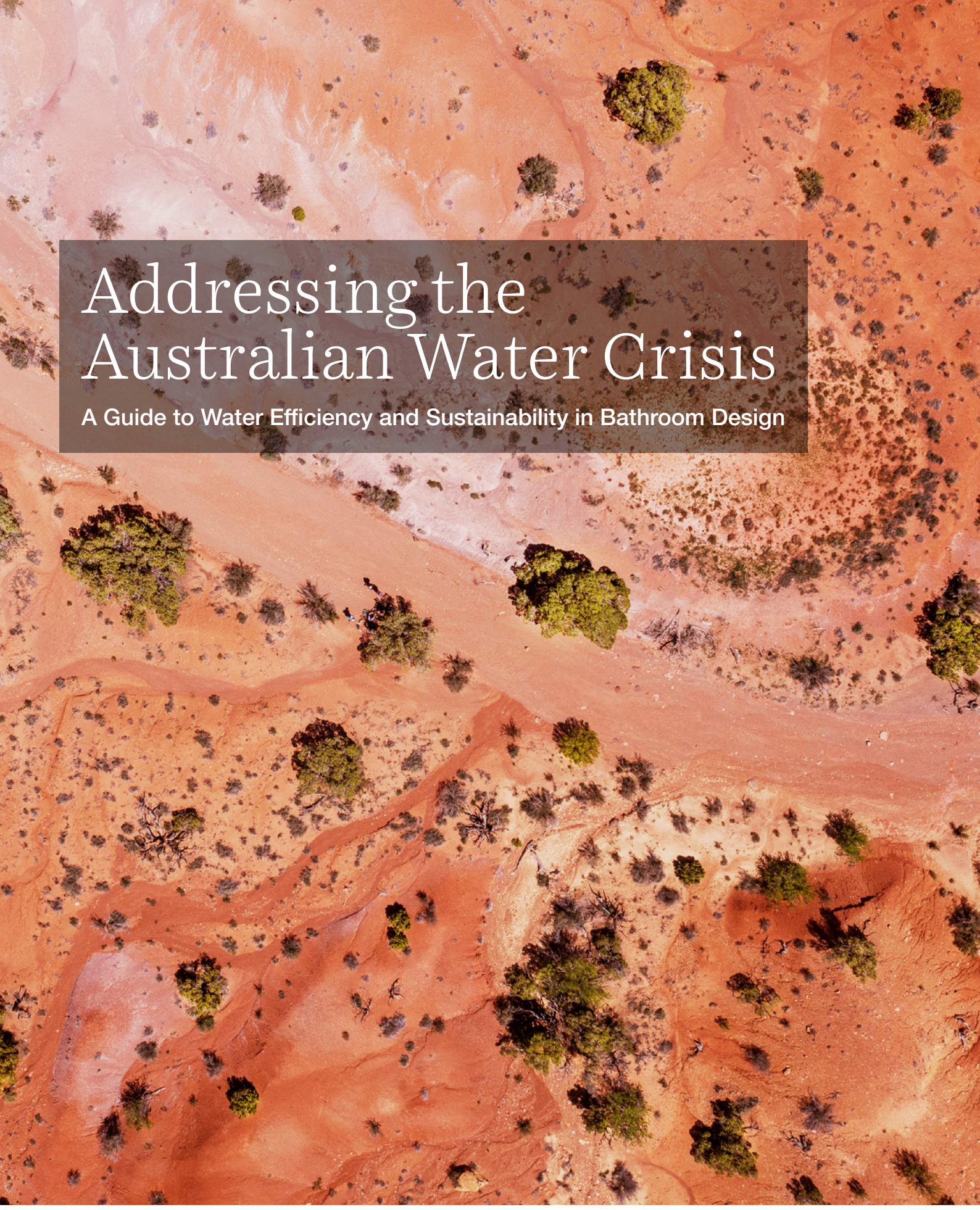
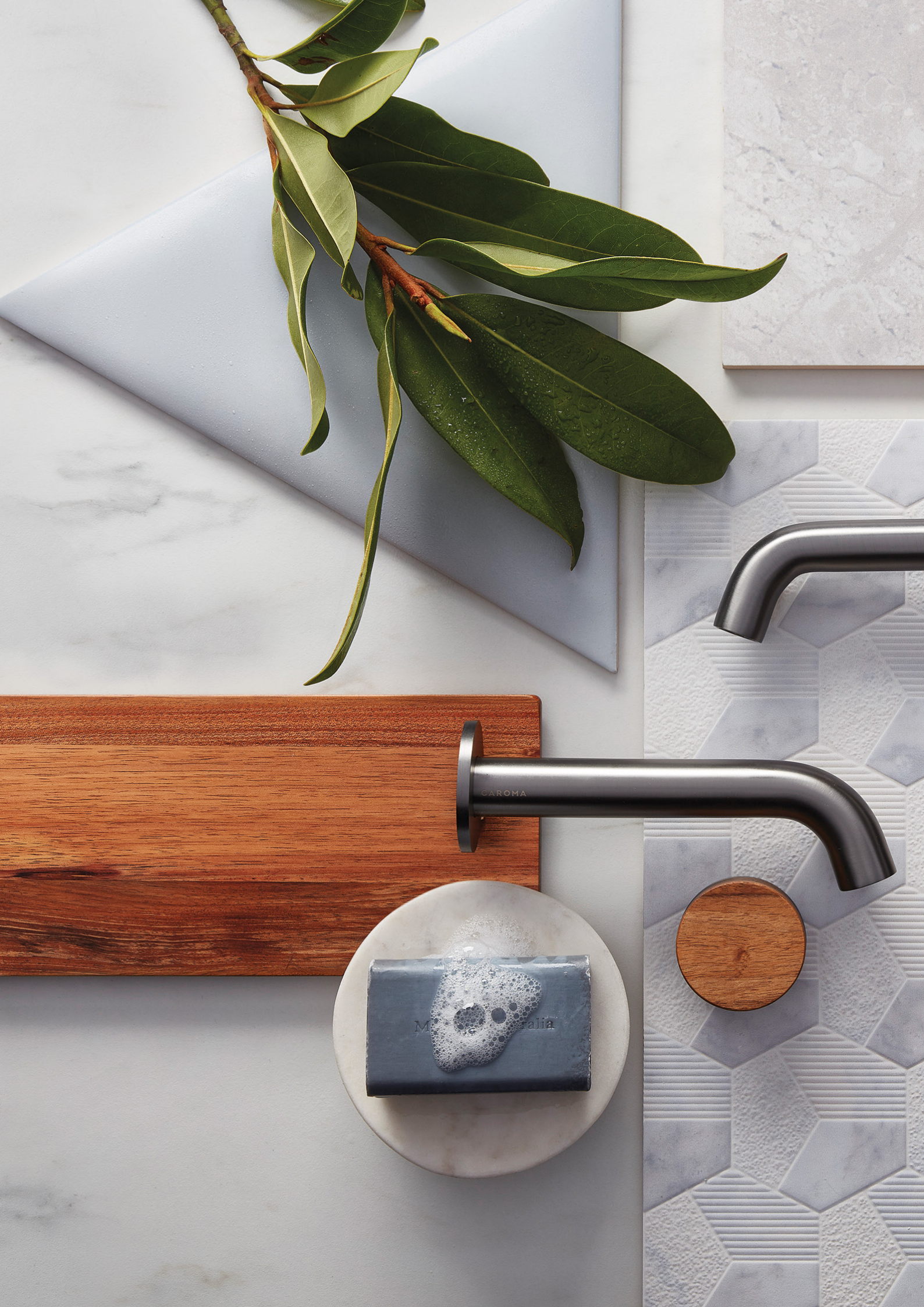
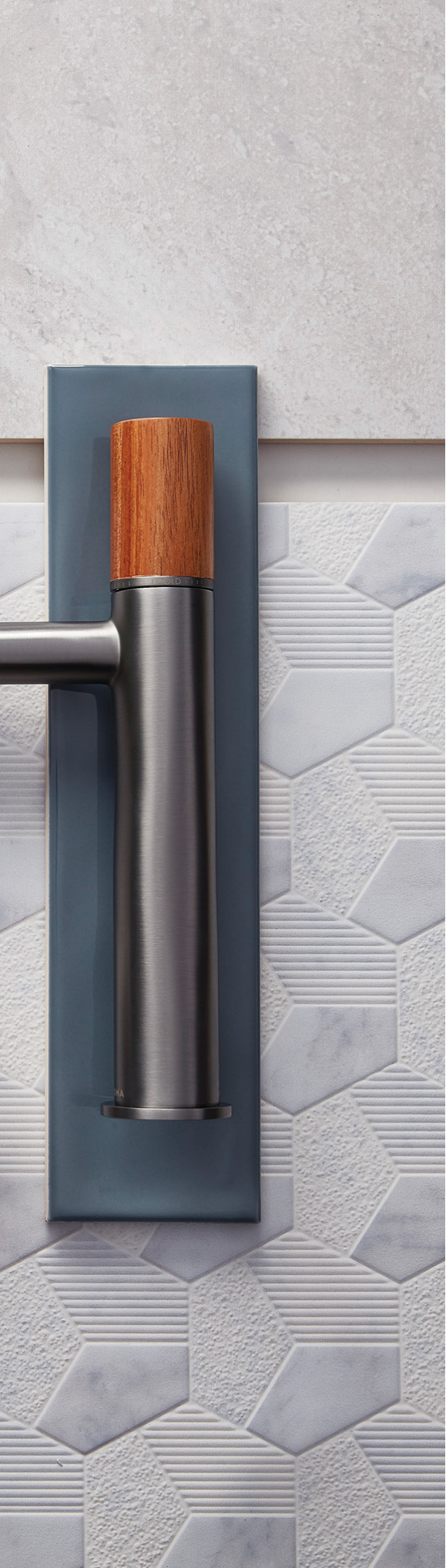


Addressing the Australian Water Crisis

A Guide to Water Efficiency and Sustainability in Bathroom Design

CAROMA


CAROMA



Introduction

Across the country, extended droughts, low rainfalls, bushfires and increasing supply demands have raised the question – when will Australia's major cities run out of water? In 2017-2018, accessible storage volumes in public water reserves dropped from 77% to 63% capacity due to persistent dry climatic conditions.[1] In the capital cities, water storage dropped collectively to 54.6% in 2019, a 30% decline since 2013.[2] Regional areas in New South Wales, Queensland, Western Australia and the Northern Territory are at risk of running out of water all together, with some drought-ravaged towns relying on convoys of trucks carting in emergency water supplies just to survive.[3]

Australia's population is growing rapidly, reaching 24 million in 2016 – a percentage increase of 25% since 2001,[4] and continuing to rise.[5] In 2018-2019, capital cities accounted for 79% of total population growth.[6] These population trends create severe stress on the available potable water supplies and dams. In January 2020, Sydney Water introduced Level 2 water restrictions when dam levels fell below 40%.[7] Sydney's water levels were depleting at a faster rate than during the "Millennium Drought", during which levels sank to as low as 33.8% in early 2007.[8]

Australia is the driest inhabited continent on earth and yet Australians are the greatest consumers of water per capita, using an average of 100,000L of freshwater per person annually.[9] In most areas and buildings, we use the same water for drinking as we do for toilets, gardening and washing. Significant changes need to occur at all levels – from consumers and property owners to designers, builders and government regulators – to protect our water for future generations.

In recent years, governments have put in place water efficiency targets for new buildings in addition to strict water use restrictions. There is also growing market demand for "green" buildings that aim to minimise their overall impact on the environment. Sustainability certification schemes such as GreenStar and the National Australian Built Environment Rating System (NABERS) have created a framework for sustainable building design. However, more needs to be done.

Design and construction professionals play a critical role in Australia's future by implementing sustainable water management in building design. Bathroom design needs special focus – showers, taps and toilets are the biggest consumers of water in the average Australian home.[10] Clean water is essential for safe drinking and hygiene, so we must use it wisely and efficiently.

This whitepaper provides a design framework for sustainable bathrooms in Australia, with a focus on reducing water consumption while maintaining performance.

Sustainable Water Management and Bathroom Design

THE REGULATORY FRAMEWORK

The technical, design and performance requirements for water services, sanitary plumbing and drainage systems, stormwater drainage systems, heating, ventilation and air conditioning systems are found in the *National Construction Code* (NCC), which incorporates the *Plumbing Code of Australia* (PCA).

When designing bathrooms, the plumbing and draining products specified must have a valid WaterMark certificate. The WaterMark Certification Scheme is a mandatory certification scheme for plumbing and drainage products. Products certified under this scheme have been assessed to be fit for purpose and authorised for use in Australian plumbing and drainage installations.

The Water Efficiency Labelling Standards (WELS) is a mandatory, national and federal government-run water efficiency labelling scheme. WELS requires the registration and labelling of showers, taps, toilets, urinals, clothes washers, dishwashers and flow controllers. This scheme aims to encourage wise water usage by informing customers about the water efficiency of a product at the point of sale. WELS provides transparent water efficiency information and star ratings for regulated products.

There are also several sustainable product and building certification schemes, such as GreenStar and NABERS, which award credits for use of water-efficient products and design. These schemes provide a framework for sustainable design that designers, specifiers and builders can put into practice and include criteria for product use, energy and water efficiency, and health and wellness.

KEY DESIGN CONSIDERATIONS

Australian bathrooms have high water usage demands. In 2016-17, households spent $10.6 billion on water and related services (up from $10.4 billion the previous year), while industry spent $6.7 billion.[11] The shower is typically the biggest water user (accounting for 34% of indoor water use in the average Australian home), while toilets come in second (at 26%).[12]

When designing a sustainable bathroom, effective water management strategies include choosing water-efficient showerheads, toilets and taps. Careful product specification is required to deliver elevated sustainability outcomes without compromising performance.

Showers

According to the YourGov website, an inefficient showerhead can use approximately 15L-25L of water per minute.[13] For a standard four-person household, replacing a showerhead that flows at 15L/min with a WELS 3-star showerhead at 9L/min saves approximately 70kL each year. In the same scenario, a WELS 4-star shower at 6L/min will save approximately 105kL each year.[14]

When selecting a showerhead, check for the water flow rate on the label. WELS star ratings consider overall water efficiency and performance of the showerhead.[15] To ensure a satisfactory shower, units should have sufficient performance in terms of spray coverage, maintenance of droplet warmth and spray force. WELS 4-star rated showerheads must pass testing based on these criteria.

The intended application and user preferences should also be considered. If the showerhead is intended for the main bathroom in a residential application, a luxurious showerhead with multiple settings may be appropriate, whereas simpler units may be more suitable for the children's bathroom. WELS-rated hand-held showerheads that are easily reached and moved are more suitable aged-care and healthcare applications where users may have physical limitations.

Toilets

WELS star ratings for toilets identify the average flush water usage of the product – the greater the star rating, the higher the water efficiency. An average flush is based on four half flushes for each full flush activation. Features like an integrated handbasin that reuses handwashing water for flushing can further reduce the average flush volume.

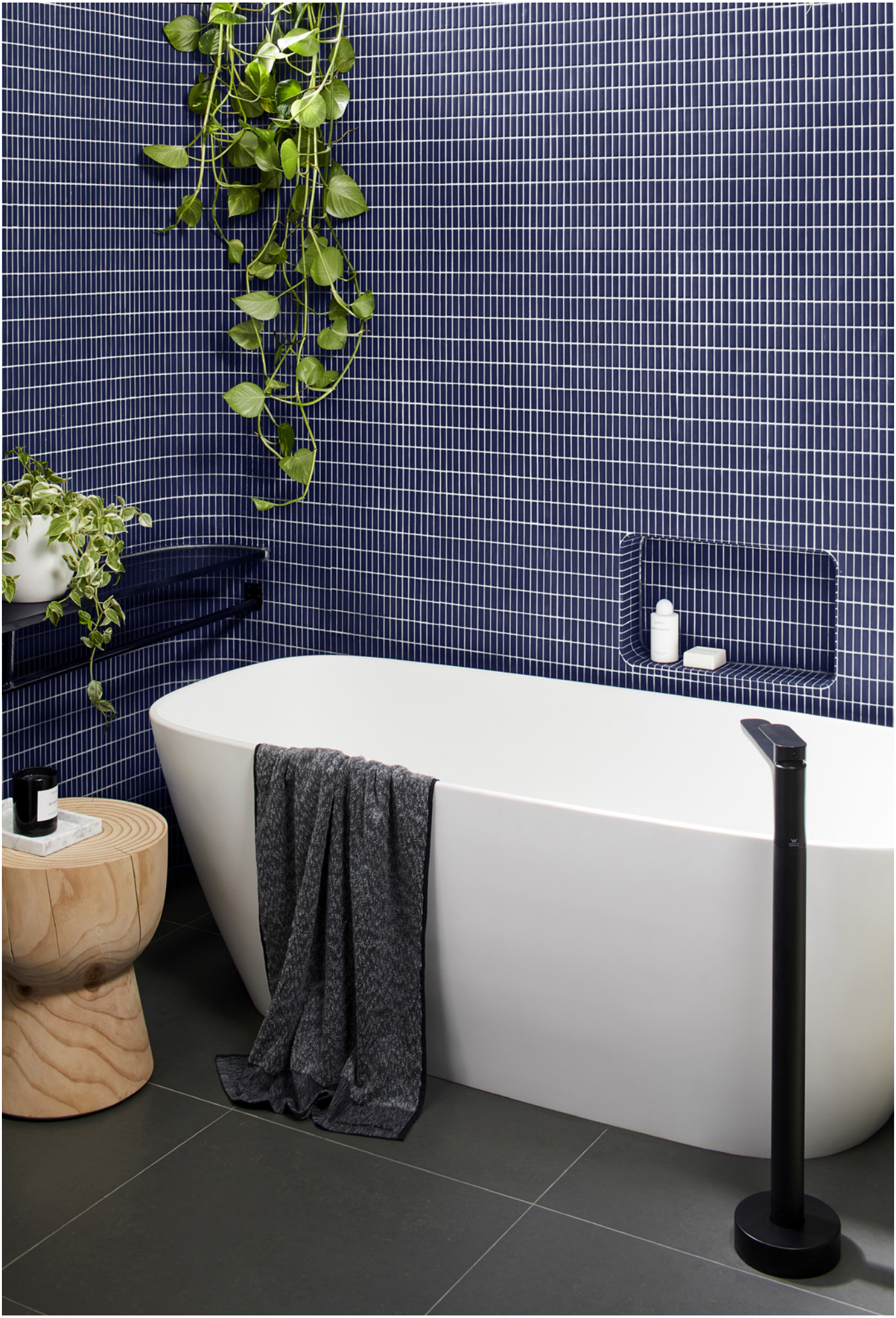
Every litre less in a flush will save a four-person household nearly 6kL in water supply charges per year (based on four flushes per person per day).[16] Replacing an old single-flush toilet that uses 12L per flush, with a 4-star dual-flush toilet flushing 4.5L for full flush and 3L for reduced flush (with an average 3.3L flush) results in significant water savings. For even greater savings, leading manufacturers offer low-flush toilets that have achieved a WELS 5-star rating with an average flush of 3L with an integrated handbasin.

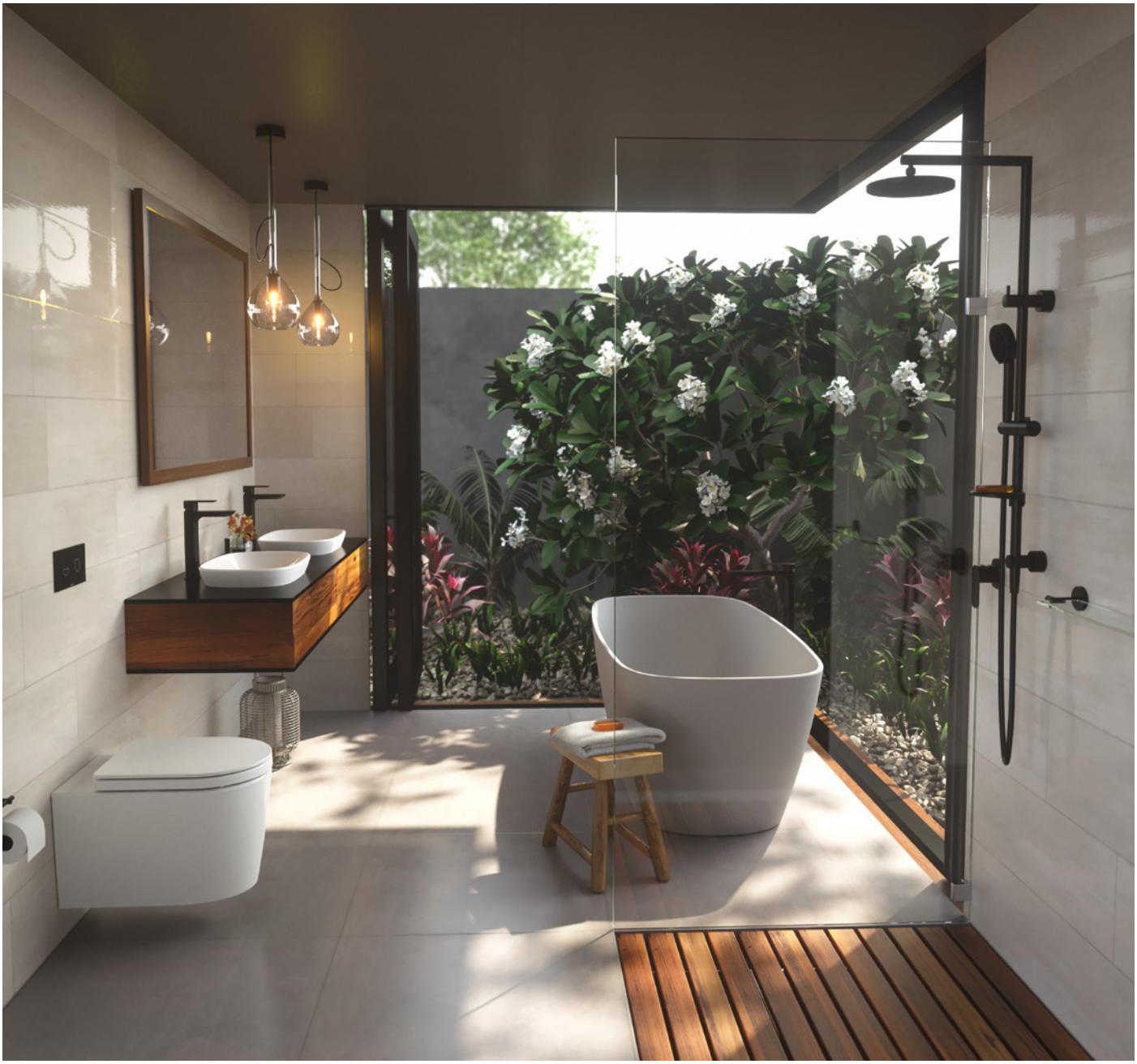
Under the WELS scheme, toilets are also tested for leakage, physical distortion, performance in discharging waste, splashing, and endurance of the inlet and outlet cistern valves. Toilets must meet the performance requirements for discharging waste at full and reduced flush as set out in AS1172.1 Water closets (WC) - Part 1: Pans.

Advanced flushing design and technology can deliver additional savings. Large, ergonomically-located water area in the sump can reduce marking. A well-designed larger trap throughway for improved hydraulic performance reduces the risk of blockages. Rimless designs improve hygiene and ease of cleaning but need to be carefully designed to ensure flush performance.

Tapware

Flow rates for taps are included on water rating labels – a high WELS star rating equates to less water consumption. The best-performing water efficient taps have a WELS 6-star rating, with a flow rate of 4L per minute or less.[17]





Low flow tapware may be considered to achieve further water usage reductions. Low flow taps mix air into the water flow, providing the impression of a full flow even though the water volume is significantly less than standard. Low flow taps can reduce tap water use from a standard 9L/min to 4.5L/min and to as little as 2L/min using WELS 6-star tapware.

Consider whether the tap offers the appropriate level of functionality for the intended application. For example, water-efficient taps are more effective at saving water in the bathroom when used for handwashing and brushing teeth, but they may not be suitable for bathtub/sink filling or laundry.

RAINWATER HARVESTING AND GREYWATER SYSTEMS

Households can save on water consumption from the main water supply by installing a well-designed rainwater harvesting system. Depending on its water quality,[18] rainwater can be used for domestic purposes including garden irrigation, toilet flushing, showering and clothes washing.

Greywater reuse systems divert the wastewater from showers, handbasins, laundry tubs and washing machines for household reuse. As greywater can contain chemicals and bacteria from its initial use, greywater must be treated to the appropriate levels of purity and hygiene.[19] Treated greywater can be reused in washing machines, toilets and gardens.[20]

While suitable for specific domestic purpose such as toilet flushing, rainwater and greywater are generally unsafe for drinking due to the risk of contamination with pathogens and harmful chemicals. There are various standards and regulations that govern the design, installation and maintenance of rainwater and greywater systems to reduce the contamination risk

CAROMA

Part of the GWA Group family of brands, Caroma is a leading designer, manufacturer and distributor of domestic and commercial sanitaryware and bathroom products. With 75 years of experience, Caroma believes that bathrooms should be beautiful, easy to use and built on a foundation of innovative, functional performance for optimum sustainability.

Caroma's wide range of classic to contemporary styles, smart design and sustainable innovation can respond to the changing demands of modern bathroom design. From the world's first plastic cistern and dual flush to Caroma Cleanflush with its innovative rimless bowl and flush and flow technology and the Smart Command ecosystem of intelligent bathroom systems, Caroma has been at the forefront of design innovation that delivers sustainable water use and management.

Caroma's experienced in-house design and engineering team develops solutions in line with consumer demands through innovative lab testing and field trials and by meeting the demands of the plumbing industry and utilities. With test labs accredited by the National Association of Testing Authorities, Caroma undertakes specific performance testing to develop solutions that go above and beyond Australian standards.

All Caroma manufacturing facilities are accredited to ISO 9001-2. The GWA Due Diligence Policy requires all supply partners to verify compliance with laws and safety conditions and maintain compliance with strict environmental and sustainability criteria.

A History of Quality, Innovation and Sustainability

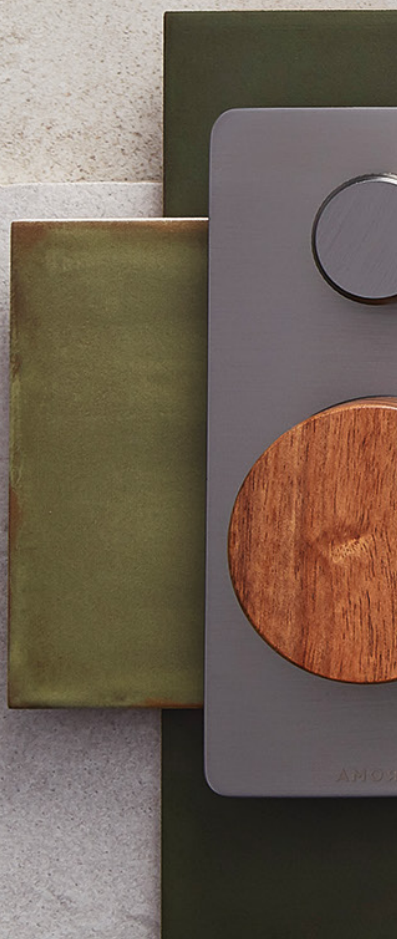
Caroma has a long history of collaborating with water authorities and plumbing industry bodies as an industry leader in water sustainability.

In 1984, the South Australian and Victorian Governments approached Caroma to develop a toilet system that would conserve water, resulting in the Caroma Dual Flush which delivered either a full flush of 11L or a half flush of just over 5L. Caroma's success led to the 1993 development of 6/3L dual-flush technology that was adopted internationally. More recently, Caroma worked extensively with government and industry bodies to establish the WELS 6-star rating for toilets averaging not more than 2.5L per flush.

Innovations in the toilet system category included 2004's Caroma Smartflush, Australia's first 4.5/3L dual-flush toilet, which saved households approximately 35,000 litres of water per annum if converting from a traditional 11L single-flush toilet. In 2007, Caroma unveiled Australia's first WELS 5-star rated toilet, The Profile™ suite with integrated handbasin, which enables the same water that is used for hand washing to be reused for toilet flushing. In 2016, the Good Design Award-winning Caroma Cleanflush combined a rimless toilet design with flush and flow technology to deliver an ultra-hygienic, water-saving solution.

In the showerhead category, Caroma has a range of WELS 3 and 4-rated showers appropriate for different usage applications. Achieving a WELS 4-star rating, Caroma Flow is the company's most efficient shower with a comfortable water flow of just 6.5L per minute.

Caroma also offers a range of taps and mixers that have been awarded WELS 5 or 6-star ratings, which are among the most water-efficient tapware solutions on the market.



REFERENCES

1 Australian Government. “Water in Australia.” Bureau of Meteorology. http://www.bom.gov.au/water/waterinaustralia (accessed 9 May 2020).

2 Wright, Ian and Jason Reynolds. “How drought is affecting water supply in Australia’s capital cities.” The Conversation. https://theconversation.com/how-drought-is-affecting-water-supply-in-australias-capital-cities-127909 (accessed 9 May 2020).

3 Barbour, Lucy, Caitlyn Gribbin and Emma Machan. “How long until drought-stricken towns run out of water?” ABC News. https://www.abc.net.au/news/2020-01-27/how-long-until-drought-stricken-towns-run-out-of-water/11655124 (accessed 9 May 2020).

4 Australian Bureau of Statistics. “3105.0.65.001 - Australian Historical Population Statistics, 2016.” ABS. https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3105.0.65.001 (accessed 9 May 2020).

5 Ibid.

6 Australian Bureau of Statistics. “3218.0 - Regional Population Growth, Australia, 2018-19.” ABS. https://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0 (accessed 9 May 2020).

7 New South Wales Government. “Level 2 water restrictions to start across Sydney.” NSW Government. https://www.nsw.gov.au/news/level-2-water-restrictions-to-start-across-sydney (accessed 9 May 2020).

8 Smith, Alexandra and Lisa Visentin. “Minister flags water recycling expansion for Sydney as drought intensifies.” Sydney Morning Herald. https://www.smh.com.au/politics/nsw/minister-flags-water-recycling-expansion-for-sydney-as-drought-intensifies-20191126-p53e90.html (accessed 9 May 2020).

9 Australian Government. “Water.” YourHome. https://www.yourhome.gov.au/water (accessed 9 May 2020).

10 Australian Government. “Water efficiency.” Energy.gov.au. https://www.energy.gov.au/households/water-efficiency (accessed 9 May 2020).

11 Australian Bureau of Statistics. “4610.0 - Water Account, Australia, 2016-17.” ABS. https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4610.0Main+Features22016-17?OpenDocument (accessed 9 May 2020).

12 Above n 9.

13 Australian Government. “Reducing water demand.” YourHome. https://www.yourhome.gov.au/water/reducing-water-demand (accessed 9 May 2020).

14 Smart WaterMark. “WELS Showers.” Smart Approved WaterMark. https://www.smartwatermark.org/WELS/showers/ (accessed 9 May 2020).

15 Ibid.

16 Above n 10.

17 Smart WaterMark. “WELS Taps.” Smart Approved WaterMark. https://www.smartwatermark.org/WELS/taps/ (accessed 9 May 2020).

18 Australian Government. “Rainwater.” YourHome. https://www.yourhome.gov.au/water/rainwater (accessed 9 May 2020).

19 Barnes, Chris. “A guide to greywater systems.” CHOICE. https://www.choice.com.au/home-improvement/water/saving-water/articles/guide-to-greywater-systems (accessed 9 May 2020).

20 Ibid.

All information provided correct as of June 2020

CAROMA