Sustainable Destination Partnership - Water Efficiency Summary Report

Reference: R.S20544.011.01 - SDP Water Efficiency Summary Report.docx
Date: June 2020
Confidential

Document Control Sheet

BMT Commercial Australia Pty Ltd Suite G2, 13-15 Smail Street Ultimo, Sydney, NSW, 2007 Australia PO Box 1181, Broadway NSW 2007 Tel: +61 2 8960 7755 Fax: +61 2 8960 7745 ABN 54 010 830 421 www.bmt.org	**Document:**	R.S20544.011.01 - SDP Water Efficiency Summary Report.docx
	Title:	Sustainable Destination Partnership - Water Efficiency Summary Report
	Project Manager:	Adam Jones
	Author:	Adam Jones, Jarrod Etherington
	Client:	City of Sydney
	Client Contact:	Ishita Singh

Synopsis: This document outlines summary findings from water efficiency assessments of ten sites assessed in conjunction with Sydney Water and the City of Sydney Sustainable Destination Partnership.

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	19/6/2020	EC	19/6/2020	AJ	19/6/2020
1	30/06/2020	IS, KS, CN	30/06/2020	AJ	30/06/2020

DISTRIBUTION

Destination	Revision										
	0	1	2	3	4	5	6	7	8	9	10
City of Sydney	PDF	PDF									
BMT File	PDF	PDF									
BMT Library											

Executive Summary

The City of Sydney and Sydney Water in conjunction with the 'Sustainable Destination Partnership' commissioned the assessment of water use at ten sites across Sydney, NSW to identify potential water efficiency opportunities and learnings across a sample of sites.

Recommended savings across all sites averaged 20.1% of baseline water use.

Sites were split across the following segments:

- Hotels (Section 4.1),
- Hostels (Section 4.2),
- Large entertainment venues (Section 4.3), and
- Small entertainment venues (Section 4.4).

An average breakup of estimated water end uses for each segment is included in this report along with key identified water savings opportunities and tips for progressing water efficiency for each segment.

As part of this project a survey and workshop were undertaken for all Sustainable Destination Partnership sites to help provide insights into the current use and application of water efficiency measures, barriers or challenges to implementation and general feedback. In general, this showed that most sites that responded have demonstrated engagement with water efficiency and that experiences on improvement projects to date had been positive with good success. Cost savings appear to be a key motivator, though sites with policies and targets around water use found this a helpful driver also.

There were a broad spread of barriers to further water efficiency improvements flagged, though the most common barriers highlighted were limitations in internal staff time resources, a lack of visibility of water use patterns and some knowledge gaps – especially in managing staff water use in kitchens.

Based on these findings there are key recommended focus areas (discussed in Section 5). These were selected based on common recommendations and anecdotally flagged barriers, and included:

- Metering and flow monitoring,
- Kitchen cleaning,
- Shower and tap flowrates,
- Proactive bathroom maintenance,
- Urinal sensor alignment and flush settings,
- Cooling tower bleed setpoint optimisation,
- Optimisations to existing alternative supply systems, and
- Cost savings with sewer discharge factors.

Contents

List of Figures

List of Tables

1 Introduction

The City of Sydney and Sydney Water in conjunction with the ‘Sustainable Destination Partnership’ commissioned the assessment of water use at ten sites across Sydney, NSW to identify potential water efficiency opportunities and learnings across a sample of sites. Sites were split across hotels, hostels and large and small entertainment venues (Table 1-1).

BMT undertook an inspection at each site, and combined this with analysis of meter readings, BMS data exports, Sydney Water Billing data, hydraulic plans, and visitor and guest records. Some dataloggers were also installed temporarily on selected main water meters.

This report provides a summary assessment of finding across all sites assessed as part of the program.

Table 1-1 Site List

Type	Site	Baseline Water Usage (kL/day)
Hotels	Hotel A	28.6
	Hotel B	113.0
	Hotel C	296.0
	Hotel D	348.1
Hostels	Hostel A	12.8
Large Entertainment	Large Entertainment A	252.4
	Large Entertainment B	841.0
Small Entertainment	Small Entertainment A	0.2
	Small Entertainment B	24.2
	Small Entertainment C	35.0

2 Overall Summary Statistics

2.1 End Use Breakup

Potable water use breakup is intended to represent a snapshot of current baseline use, unaffected by seasonal factors. It was developed for each site from a combintaion of analysis of flow monitoring, meter reading records, site inspections and discussions with site staff.

Figure 2-1 shows the combined average proportion of end uses across all 10 sites investigated. Section 4 shows this Breakup specific to each segment, better reflecting the unique nature of each segment.

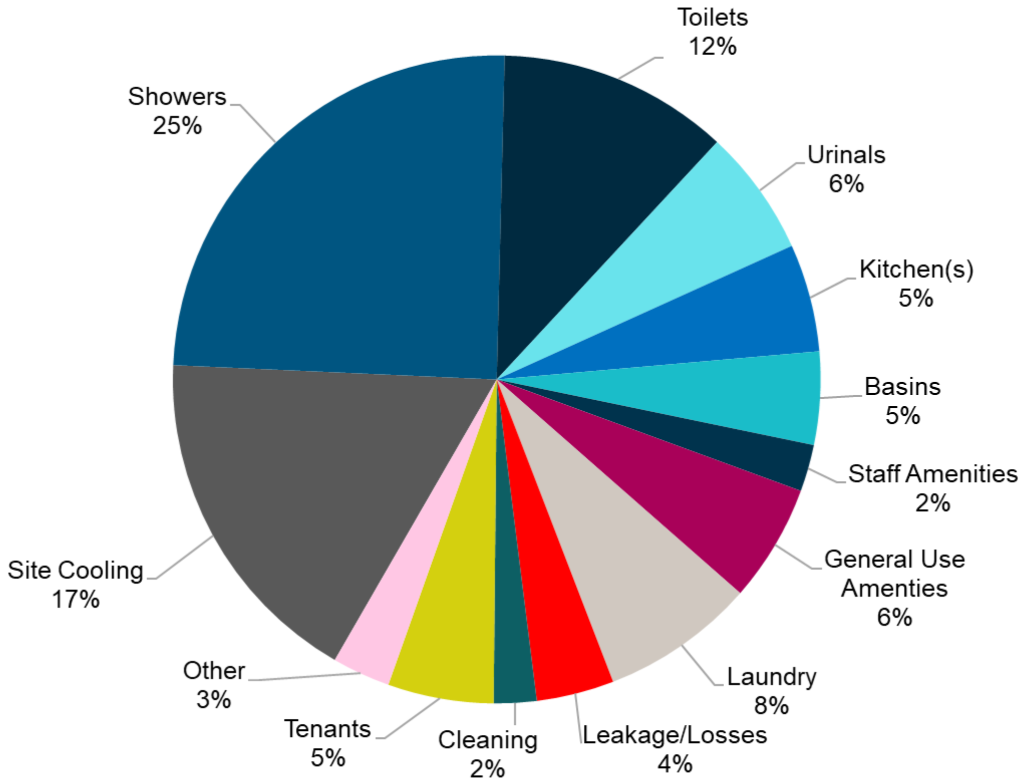

Figure 2-1 Potable Water Use Breakup by Area/End Use (%) – Overall

Key points to note from this breakup are:

- Showers (25%) make up the largest water usage by a significant margin – driven by the accommodation segments.
- Site cooling (17%) (i.e. evaporative coolers/humidifiers) and toilets (12%) makes up the second and third largest water end uses respectively.
- Leakage/losses accounted for an average 4% of total water use across all sites. These were typically attributed to toilet leaks, tank overflows and cooling tower losses. Common recommendations to mitigate these losses included proactive checking/site maintenance and flow monitoring (See Section 5.1).

- General use amenities (i.e. conference, event and common area toilets and basins) make up 6% of total water use.
- Kitchen water use average 5% however savings measures were commonly found regarding cleaning and hose down practices (see Section 5.2). Kitchen use varies between each segment.
- Tenants make up 5% of total site waster use. The tracking of tenanted areas was included as a recommendation in flow monitoring (See Section 5.1).
- Laundry (8%) is artificially inflated due to significant water use in the laundry at one site compared to other sites.
- For the purposes of this assessment 'Other' included end uses including general cleaning/end of trip facilities/laundry/fire testing where it was not a specific metered activity.

2.2 Potential Savings

Recommendations for potential water savings opportunities for each of the ten sites were compiled. Recommended savings across all sites averaged 20.1% of baseline water use. Overall conclusions made from water savings recommendations at all sites included:

- Decreasing shower flow rates provided the highest average saving to baseline water use after alternative supply (retrofit), with a relatively low average payback period. This is expected due to the significant proportion of total water makeup by shower usage in the accommodation segments.
- Flow monitoring for optimisations and fixing of leakage provided consistent water savings across a range of segments with a relatively low average payback period. This is expected due to the significant proportion savings which can be attributed to proper tracking of water (See Section 5.1)
- Kitchen hosing and leaning practice optimisations, urinal sensor/flush adjustments and cooling tower bleed set point optimisation were found to have relatively low savings potential, however, are typically inexpensive improvements.
- Retrofitting alternative supply options (i.e. rainwater tanks) has the potential to offset large amounts of potable mains water for some sites, however, has a significantly high payback period attributed to a high cost and complexity for retrofitting systems.
- Providing additional alternate (non-potable) water supply as an addition to existing infrastructure (e.g. adding sources or end uses to existing rainwater systems) was considered a potentially viable recommendation, though to a complete retrofit of new alternate supply systems generally had a poor return on investment.

3 Feedback from Site Staff

As part of this project a survey and workshop were undertaken for all Sustainable Destination Partnership sites to help provide insights into the current use and application of water efficiency measures, barriers or challenges to implementation and general feedback.

In general, this showed that most survey respondents have had engagement with water efficiency and that experiences on improvement projects to date had been positive with good success. Cost savings appear to be a key motivator, though sites with policies and targets around water use found this a helpful driver also.

There were a broad spread of barriers flagged to be impeding water efficiency improvements, though the most common barriers highlighted were limitations in internal staff time resources, a lack of visibility of water use patterns and some knowledge gaps – especially in managing staff water use in kitchens. Guest satisfaction risk is a common perceived risk from management staff (for example with low flow showers), though it has rarely been found to be ultimately a barrier in practice.

Details of findings are provided in the following sections.

3.1 Survey Responses

An online survey was sent to all SDP participants in February 2020 and there were 14 responses.

Survey responses showed that over the past three years, most sites had undertaken changes to decrease water use (Figure 3-1).

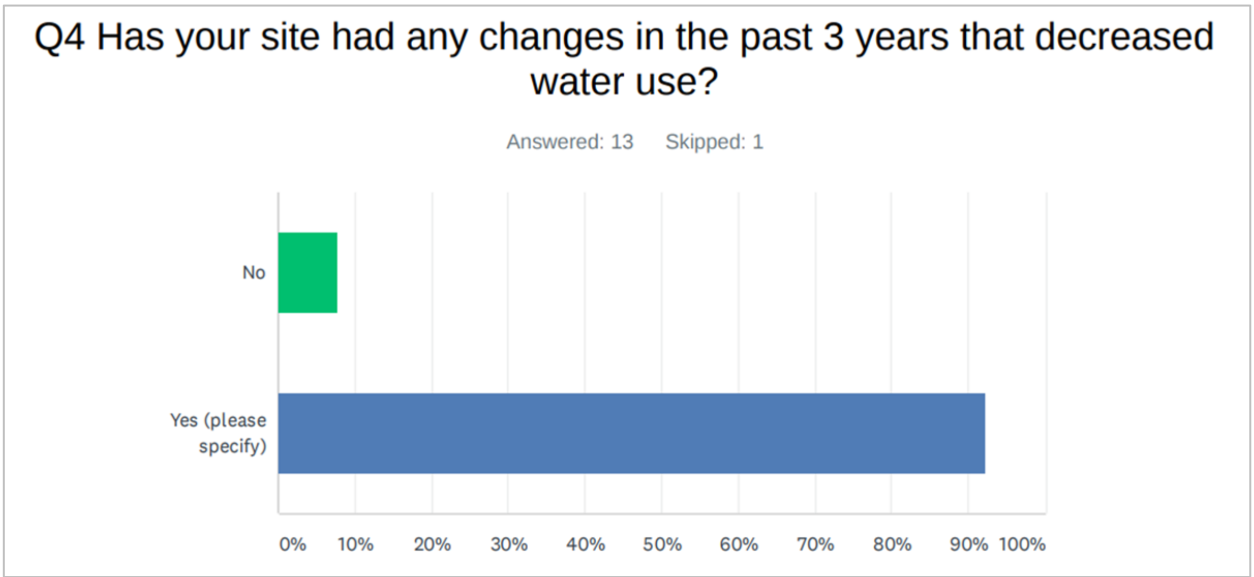

Figure 3-1 Any Changes in Past 3 years that Decreased Water Use?

As a result of implemented water efficiency changes/projects, most sites did not experience negative feedback from guests or staff (Figure 3-2).

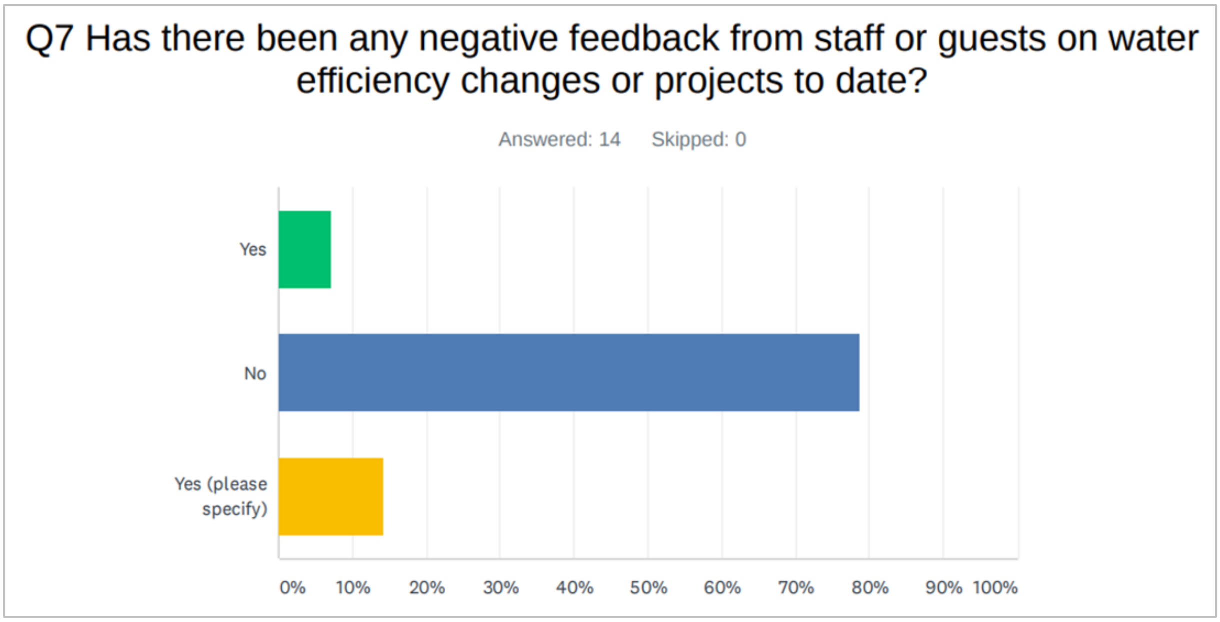

Figure 3-2 Negative Feedback from Staff/Guests on Water Efficiency Changes/Projects?

The key drivers for the projects implemented included reducing water and other (energy/staff) costs, a dedicated internal budget and internal corporate policies and targets (Figure 3-3).

ANSWER CHOICES	RESPONSES	
Corporate policy/targets	61.54%	8
Sustainability for marketing etc	23.08%	3
Dedicated internal budget for efficiency initiatives	61.54%	8
External funding assistance	7.69%	1
Reducing water costs	84.62%	11
Reducing other costs (eg energy, staff time, other costs)	69.23%	9
Other (please specify)	7.69%	1
Total Respondents: 13		

Figure 3-3 Key Drivers for Past/Planned Upgrades

A lack of internal staff time resources was considered in the survey results as the fundamental barrier to implementing/progressing water efficiency projects. However, return on investment, low priority and a low expectation for room for improvement were also commonly selected barriers (Figure 3-4).

ANSWER CHOICES	RESPONSES	
Assumed to have poor return on investment	30.77%	4
Investigated and found to have poor return on investment	30.77%	4
Lack of internal staff time resources	69.23%	9
Unclear who is responsible	7.69%	1
Safety/health risk	7.69%	1
Guest satisfaction risk	38.46%	5
Lack of guidance in selecting optimal opportunities	15.38%	2
Low priority/urgency	30.77%	4
Expecting little remaining opportunity to improve	30.77%	4
Other (please specify)	23.08%	3
Total Respondents: 13		

Figure 3-4 Key Barriers to Progressing Water Efficiency Projects

3.2 Workshop Feedback

Key feedback captured in a workshop conducted as part of the SDP meeting on 2/3/2020 is described below:

- Return on Investment (ROI) was anecdotally a key consideration and barrier for implementation of water efficiency measures/upgrades. An ROI of 2 – 3 years was typically considered acceptable.
- Guest satisfaction was also considered a concern. An example of management reluctance to reduce shower flowrates was common.
- Staff practices were noted as a constant challenge for site management. This was largely due to the continual changeover of staff and contractors, and limited metrics to track practices. For example, it is hard to keep track of water use/leaks in rooms (i.e. one person thinking the other will report an issue), and potential double up of cleaning practices (e.g. double flushes of toilets). Similarly, in kitchen areas it is difficult to keep track of how areas are being cleaned (without sub metering or flow monitoring for most sites), and difficult to influence practices without a better understanding of best practice.

Key Focus Areas:

- Participating sites indicated they were generally already comfortable with pushing into best-practice flowrates for showers and taps in rooms – with several sites successful in pilot testing shower flowrates as low as 6 L/min without notable guest complaints.
- A number of site staff expressed the challenge of low 'visibility' of water use – with relatively low penetration of water sub metering and flow monitoring across the segments it is impossible for many site staff to proactively track consumption in specific areas. Even the small proportion with

sub meters trended with a flow tracking system or BMS, the general satisfaction of the functionality of the system was limited.

- The workshop discussion had a focus on challenges to managing kitchen water usage – with this being a common area that site staff find challenging to have effective influence. Several issues/comments were raised regarding water usage in kitchens:
  - Submetering in kitchens is rare across the sites, making tracking of actual consumption difficult.
  - There is no incentive for staff or contractors to use water efficient practices, and this appears difficult to influence. One example is that recruitment of high-quality Head Chefs/Kitchen Managers is a difficult task and this limits leverage in enforcing sustainable practices generally.
  - If kitchens are not directly run by site (i.e. tenants) often making changes to on-charge for water, energy and gas can be politically complicated.
  - It is not always easy to keep track of cleaning contractors, particularly after hours
  - There is concern over hosing practices using lots of water and damaging equipment, particularly electrical components
- There is no common understanding of legal requirements or guidelines for cleaning/hose down procedures

This feedback helped to inform and target some work to progress additional findings included in Section 5.

4 Segment Summaries

4.1 Hotels

The hotels selected for detailed water efficiency assessments were targeted to represent different typical arrangements including star rating, room numbers, room types, additional amenities (i.e. conference rooms, restaurants and bars) and other on-site facilities (i.e. gyms, tenants).

These variations in facilities that can consume large volumes of water make it difficult to effectively compare the performance of one site to another, but benchmarking can still provide some broad indicators. Site benchmarks of water use per room per day are compared to the Sydney Water Benchmark for each site in Table 4-1.

Table 4-1 Hotel Selected for Assessment

Site Name	Baseline Water Use (kL/day)	Number of Rooms	Benchmark (kL/room/day)	Sydney Water[1] 'Best Practice' Hotels (kL/room/day)	Sydney Water 'Efficient' Hotels (kL/room/day)
Hotel A	28.6	166	0.17	0.4	0.4-0.45
Hotel B	113	340	0.33		
Hotel C	296	892	0.33		
Hotel D	348.1	582	0.51		

[1] Sydney Water (2020) Benchmarks for water use, viewed 08/06/2020, < http://www.sydneywater.com.au/SW/your-business/managingyour-water-use/benchmarks-for-water-use/index.htm>

4.1.1 Average Water Use Breakup

Potable water use breakup is intended to represent a snapshot of current baseline use, unaffected by seasonal factors. It was developed for each site from a combination of analysis of flow monitoring, meter reading records, site inspections and discussions with site staff. Figure 4-1 illustrates the average percentage of hotel area/end use across the four sites.

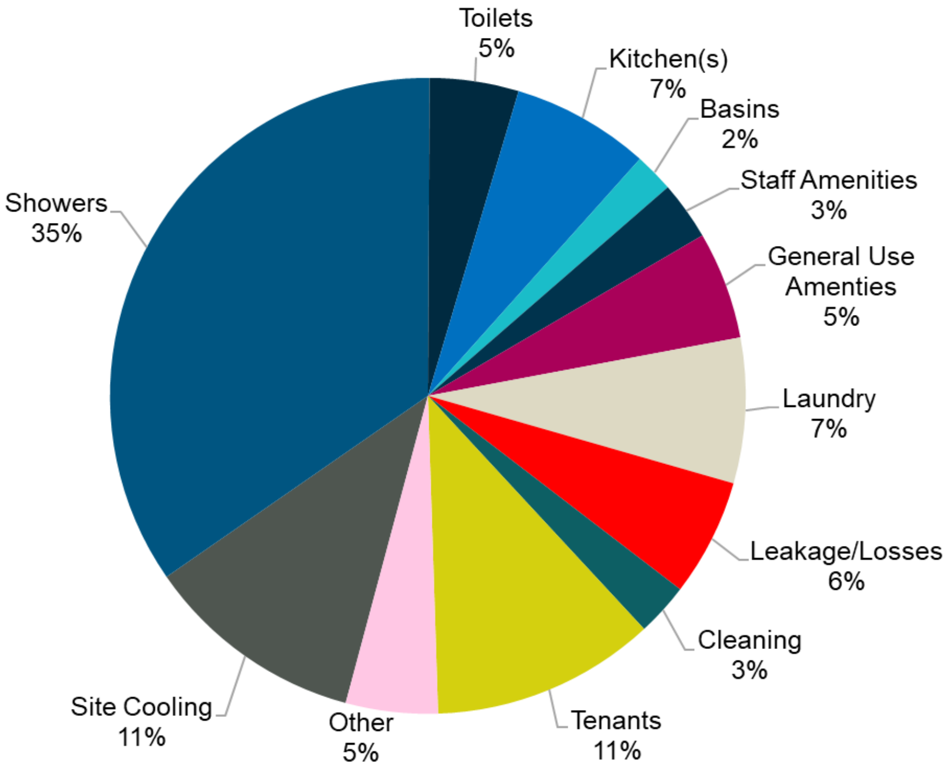

Figure 4-1 Potable Water Use Breakup by Area/End Use (%) – Hotels

Key points to note from this breakup are:

- Showers (35%) make up the largest water usage by a significant margin. This is despite all sites having invested in showerheads with reduced flowrates, and several sites implementing best-practice flowrates of 6-7 L/min.
- Cooling towers were installed at 3 out of 4 sites and consumed an average of 11% of total site consumption.
- Leakage/losses accounted for an average 6% of total water use across all sites. These were typically attributed to toilet leaks, tank overflows and cooling tower issues. Commonly recommendations to mitigate these losses included proactive checking/site maintenance and flow monitoring (See Section 5.1).
- General use amenities (i.e. conference/common area toilets and basins) were estimated to make up 5% of total water use.
- Kitchen water use averaged 7% however savings measures were commonly found regarding cleaning and hose down practices (see Section 5.2).

- Room toilets (5%) and basins (2%) make up a small percentage of site water use. This is largely due to the significant focus placed upon replacement toilets with water efficient models (3 – 4.5L flushes) and installation of flow regulation in room and amenities basins (4 – 6 L min). Note this is not current best practice (3-4L min) however it is an improvement on no flow regulation (15 – 25 L/min).
- Tenants make up 11% of total site waster use. The tracking of tenanted areas was included as a recommendation in flow monitoring (See Section 5.1).
- For the purposes of this assessment 'Other' included end uses including general cleaning/end of trip facilities/laundry/fire testing where it was not a specific metered activity.

4.1.2 Summary of Recommendations

Recommendations for potential water savings opportunities for each of the four sites are summarised in Table 4-2 and Figure 4-2 including percentage of baseline saved and payback period (years). Water savings recommendations have been ordered from highest percent of baseline usage to lowest.

Table 4-2 Saving Statistics by Recommendation Type – Hotels

Recommendation	% Baseline Water Usage	Payback Period (years)
Decrease Shower Flowrate	10.3%	2.3
Flow Monitoring to Identify Leakage, Losses and Optimisations	9.5%	2.0
Plant Efficiency Improvements	4.7%	8.1
Kitchen Hosing and Cleaning Practice Optimisations	2.6%	0.9
Optimisations to Existing Alternative Supply Systems	2.0%	3.1
Flow Regulation in Basin Taps	1.3%	2.7
Urinal Sensor/Flush Adjustment	0.5%	0.9
Cooling Tower Bleed Set Point Optimisations	0.2%	1.1

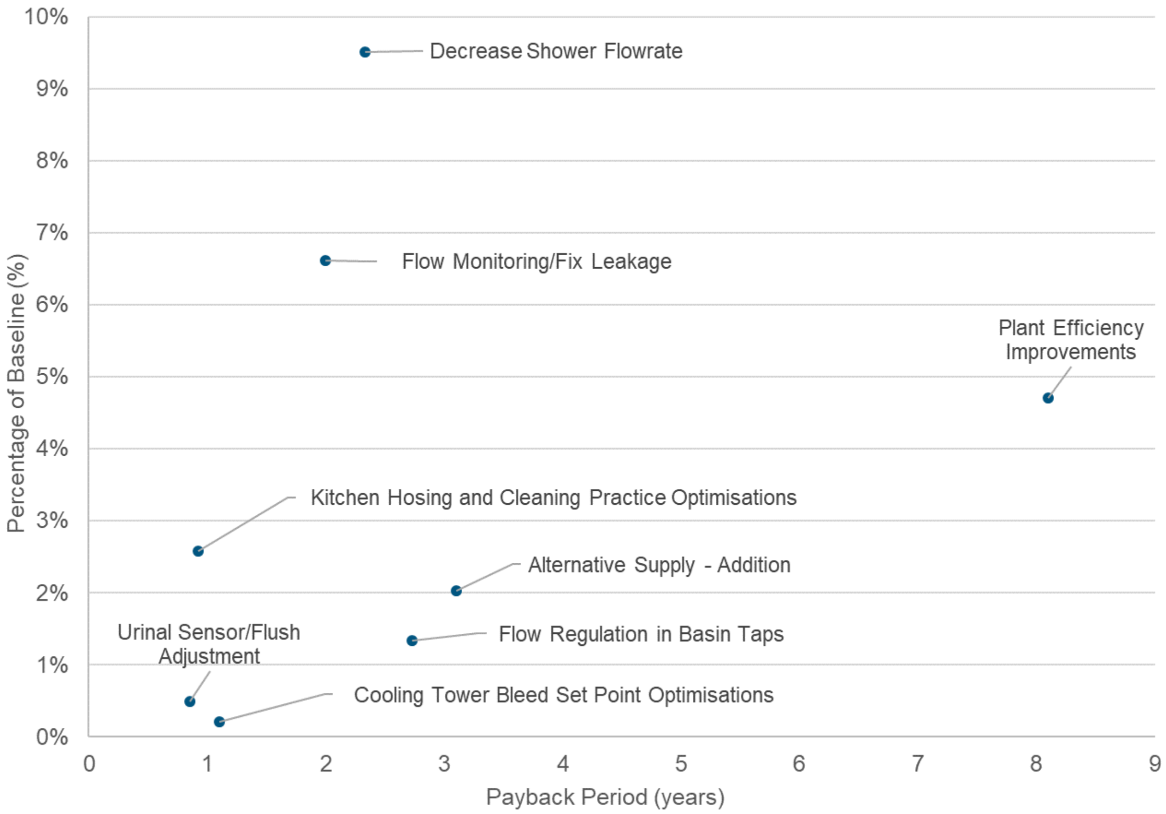

Figure 4-2 Hotel Recommendations – Percentage of Baseline against Payback Period

Key points to note from this are:

- Decreasing shower flow rates provided the highest average saving (10.3%) to baseline water use, with a relatively low average payback period (2.3 years). This is even despite most flowrates across the sites already being relatively efficient at less than 10 L/min. This appears to be due to guest shower use being consistently high, and that energy savings associated with hot water savings improve cost effectiveness. This is discussed further in Section 5.3.
- Flow monitoring and provides the second highest average saving (9%) to baseline water use, with a relatively low average payback period (1.3 years). This is due to the fact that most hotel sites have a large number of water end use points, and this is almost certain to mean that over time a range of leaks and unexpected losses will occur in rooms, plant areas, pools, tanks, cooling towers, kitchens, bathrooms etc. With many of these leaks hidden and unlikely to immediately cause damage or complaints, it is necessary for there to be a dedicated means of identifying and alerting new and existing issues. Section 5.1 discusses this further.
- Optimisations to Existing Alternative Supply Systems (i.e. The addition of air handling unit condensate to existing rainwater tanks) provided an average saving of 2% on baseline water use, with a relatively low payback period (3.1 years)
- Cooling tower bleed set point optimisation and urinal sensor/flush adjustments and have relatively low savings potential however are typically inexpensive improvements.

- Plant efficiency recommendations in this case refer to laundry improvements at one site. Leakage and losses in plant areas are captured in the Flow Monitoring to Identify Leakage, losses and Optimisations

4.1.3 Existing Efficiencies

Notable existing efficiencies were observed during the site visits to each of the hotels. Key trends for existing efficiencies included:

- All sites had some level of water efficient fixtures in rooms (e.g. flow restrictors in basins and/or low flow showers), efficient kitchen fixtures (e.g. dishwashers and waterless woks)
- All sites had a leak reporting system for site staff, and some sites had a proactive maintenance program to regularly check rooms and plant areas to flag worn equipment and fixtures for replacement before they fail.
- Some sites had an alternative supply system servicing toilets and urinals, either an onsite water treatment and reuse system or a rainwater storage facility.
- Some sites had signage displaying sustainability objectives or water use targets to influence staff or guest behaviours with respect to water use.
- Some sites had water sub meters installed and some method of tracking consumption – such as with regular readings.

4.1.4 Tips for Progressing Water Efficiency in a Hotel

Based on the findings from this project, these are the key tips to help target improved water efficiency in an average hotel:

- Check tap and shower flowrates in rooms. Some sites have already successfully implemented shower flowrates as low as 6 L/min and tap flowrates as low as 3 L/min. This can be achieved reliably through retrofitting new shower fittings and pressure-compensated aerators in tap spouts. For fit outs with integrated shower designs, in-line technologies have also been successfully trialled. See Section 5.3 for more details
- Even after a retrofit of showers and taps it is recommended that flowrates be regularly checked as they have been found to increase gradually over time with wear at some sites. There are more details in Section 5.4.
- Installing water sub meters and tracking these at high resolution with flow monitoring is a key tool that will likely pay for itself by enabling rapid identification of leaks and losses that would have otherwise gone unnoticed for long periods of time. This is discussed in Section 5.1.
- Investigate the potential to reduce or eliminate hosing in kitchens, as discussed in Section 5.2
- Check urinal settings as discussed in Section 5.5
- Regularly check cooling tower conductivity as discussed in Section 5.6.

- Investigate the potential to optimise existing alternative supply (i.e. The addition of air handling unit condensate to existing rainwater tanks) to offset toilet/urinal water use, as discussed in Section 5.7.

4.2 Hostels

Only one hostel was selected for a detailed water efficiency assessment. The hostel houses dorm rooms, kitchen, laundry, roof top area, permanent living area for staff. The hostel is open year-round.

Benchmarking is a process that allows water use performance to be gauged over time or compared to other similar sites. This is done by tracking water consumption along with measurable 'key performance indicators' or KPIs. The current benchmark for each the site is shown in Table 4-3.

Table 4-3 Hostel Selected for Assessment

Site Name	Baseline Water Use (kL/day)	Guests per day	Benchmark (L/guest/day)
Hostel A	12.8	100	128

4.2.1 Average Water Use Breakup

Potable water use breakup is intended to represent a snapshot of current baseline use, unaffected by seasonal factors. It was developed for each site from a combination of analysis of flow monitoring, meter reading records, site inspections and discussions with site staff. Figure 4-3 illustrates the average percentage of area/end use across the one site.

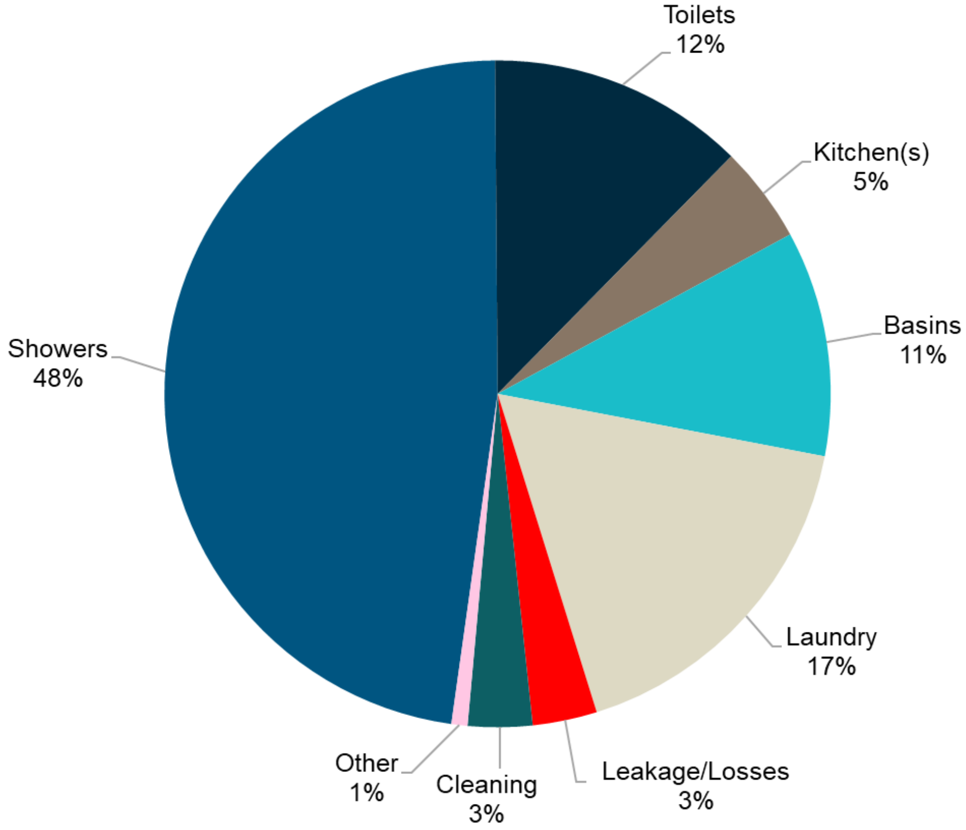

Figure 4-3 Potable Water Use Breakup by Area/End Use (%) – Hostel

Key points to note from this breakup are:

- Showers (48%) make up the largest water usage by a significant margin.
- Leakage/losses accounted for 3% of total water use. This is considered relatively low for a site of this use – likely assisted by preventative maintenance and regular leak checking practices.
- Laundry (washing machines) account for 17% of the baseline water use, even with upgrades to best practice washing machines.
- Basins (11%) and toilets (12%) make up a similar percentage of site water use.
- For the purposes of this assessment 'Other' included end uses including water features and common area items such as coffee machines.

4.2.2 Summary of Recommendations

There was a single recommendation that showed a cost-effective water saving as shown in Table 4-4.

Table 4-4 Saving Statistics by Recommendation Type – Hostel

Recommendation	% Baseline Water Usage	Payback Period (years)
Regular Checking of Shower and Tap Flowrates, with replacement as required.	15.6%	0.6

Key points to note from this are:

- This refers to mitigating the effect of shower and tap flowrates increasing over time with wear – as discussed in Section 5.4.
- Additional recommendations (without directly attributable water savings) included shower timers to encourage shorter showers and main meter flow monitoring to alert leaks and losses.

4.2.3 Existing Efficiencies

Notable existing efficiencies were observed during the site, including:

- Water efficient fittings and appliances
- Proactive leak checking and effective site water management
- Signage displaying sustainability objectives or water use targets.

4.2.4 Tips for Progressing Water Efficiency in a Hostel

Based on the findings from this project, these are the key tips to help target improved water efficiency in an average hostel:

- Check tap and shower flowrates in rooms. Some sites have already successfully implemented shower flowrates as low as 6 L/min and tap flowrates as low as 3 L/min. This can be achieved reliably through retrofitting new shower fittings and pressure-compensated aerators in tap spouts. For fit outs with integrated shower designs, in-line technologies have also been successfully trialled. See Section 5.3 for more details
- Even after a retrofit of showers and taps it is recommended that flowrates be regularly checked as they have been found to increase gradually over time with wear at some sites. There are more details in Section 5.4.
- Tracking the main water meter flow monitoring is a key tool that can enable rapid identification of leaks and losses that are not picked up by maintenance staff. This is discussed in Section 5.1.

4.3 Large Entertainment Venues

Although both classified as large entertainment venues Large Entertainment A and Large Entertainment B are difficult to compare (Table 4-5). These have very different visit patterns from visitors and Large Entertainment B incorporates significant accommodation areas, though both sites share:

- Several large kitchens
- Public use bathrooms exposed to areas of high foot traffic
- High cooling loads
- Alternate water supply systems to toilets and urinals in public areas

Table 4-5 Large Entertainment Venues Selected for Assessment

Site Name	Baseline Water Use (kL/day)	Average Visitors per day	Benchmark (L/visitor/day)
Large Entertainment A	252.4	3,544	71.2
Large Entertainment B	841	32,323	26

4.3.1 Average Water Use Breakup

A potable water use breakup is intended to represent a snapshot of current baseline use, unaffected by seasonal factors. It was developed from a combination of analysis of flow monitoring, meter reading records, site inspections and discussions with site staff. Figure 4-4 illustrates the average breakup of water use.

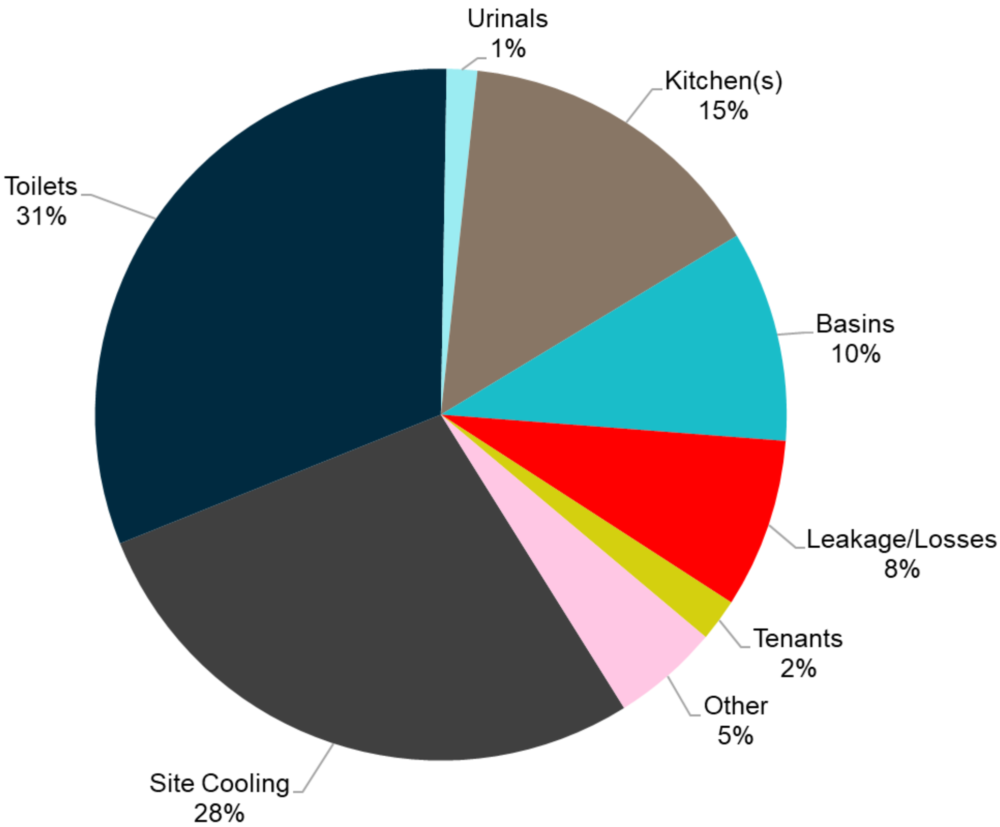

Figure 4-4 Potable Water Use Breakup by Area/End Use (%) – Large Entertainment Venues

Key points to note from this breakup are:

- Toilets (31%) and Site Cooling (28%) make up the two largest water end uses by a significant margin – due to the large number of site visitors and large volumes of air requiring cooling.
- Leakage/losses accounted for an average 8% of total water use. Leaks identified included toilet leaks, tank overflows, pool leaks and cooling tower losses. Common recommendations to mitigate these losses included regular tracking of submetering with flow monitoring (See Section 5.1).
- Kitchen water use averaged 15%, despite several kitchen areas already implementing cleaning without the use of hosing (as discussed in Section 5.2).
- Tenants make up 2% of total site waster use. The tracking of tenanted areas was included as a recommendation in flow monitoring (See Section 5.1).
- For the purposes of this assessment 'Other' refers to end uses including general cleaning, end of trip facilities and laundry areas.

4.3.2 Summary of Recommendations

Recommendations for potential water savings opportunities for the two sites are summarised in Table 4-6 and Figure 4-5 including percentage of baseline saved and payback period (years). Water savings recommendations have been ordered from highest percent of baseline usage to lowest.

Table 4-6 Saving Statistics by Recommendation Type – Large Entertainment Venues

Recommendation	% Baseline Water Usage	Payback Period (years)
Flow Monitoring to Identify Leakage, Losses and Optimisations	7.9%	1.7
Decrease Shower Flowrate	7.3%	1.6
Plant Efficiency Improvements	2.0%	2.4
Kitchen Hosing and Cleaning Practice Optimisations	2.0%	0.2
Optimisations to Existing Alternative Supply Systems	2.0%	7.5
Flow Regulation in Basin Taps	2.0%	2.1

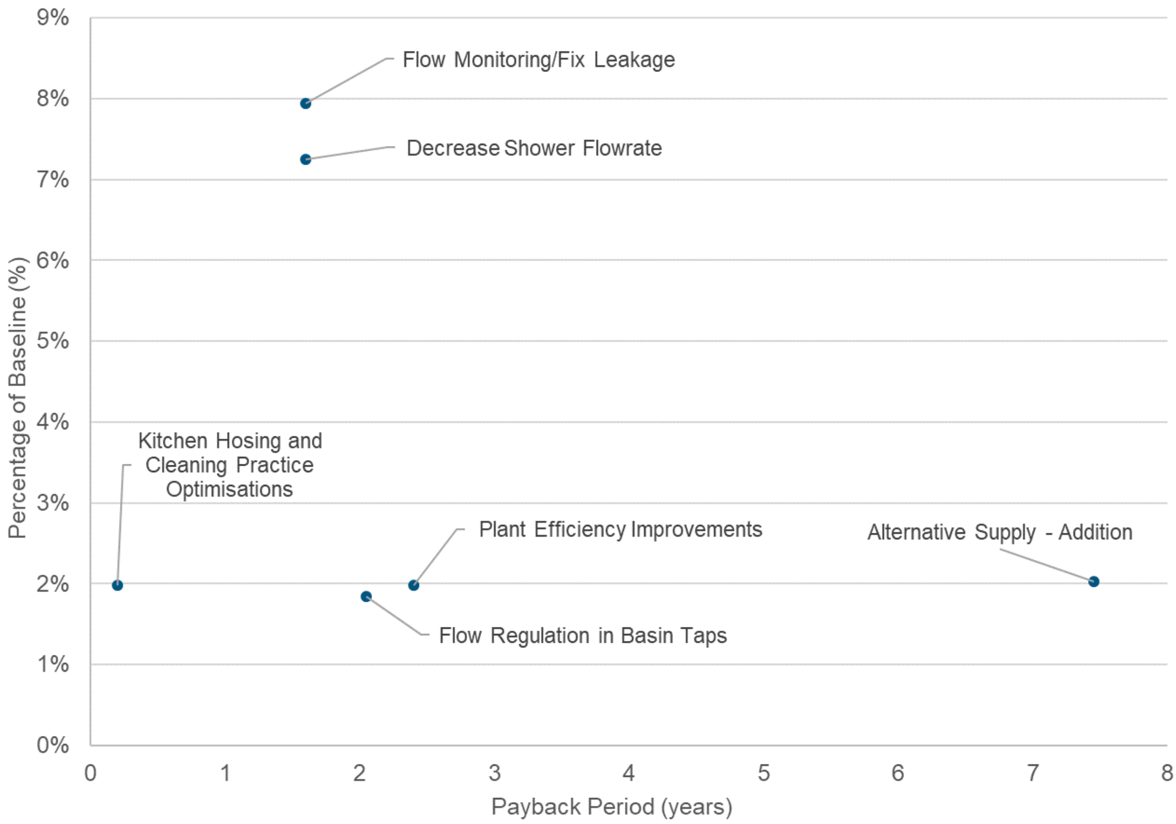

Figure 4-5 Large Entertainment Recommendations – Percentage of Baseline against Payback Period

Key points to note from this are:

- Flow Monitoring to Identify Leakage, Losses and Optimisations provides the highest average saving (7.9%) to baseline water use, with a relatively low average payback period (1.7 years). This is expected due to the significant proportion savings which can be attributed to proper tracking of water (See Section 5.1)
- Decreasing shower flow rates provided the third average saving (7%) to baseline water use, with a relatively low average payback period (1.6 years). This is expected due to the significant proportion of total water makeup by shower usage.

- Plant efficiency improvements in this case refers to specific optimisations to avoid cleaning water losses from water treatment systems
- Kitchen hosing/cleaning practice optimisations and flow regulation in basins have relatively low savings potential however are typically inexpensive improvements.

4.3.3 Existing Efficiencies

Notable existing efficiencies were observed during the site visits to each of the large entertainment venues. Key trends for existing efficient included:

- Both sites had some level of water efficient fixtures in rooms/general areas (e.g. flow restrictors in basins and/or low flow showers), efficient kitchen fixtures (e.g. dishwashers and waterless woks) and some form of alternative supply to potable water (i.e. onsite water treatment/rainwater tank)
- One site had signage displaying sustainability objectives or water use targets.
- Both sites had sub-metering installed, though only one site is tracking consumption through these meters, and optimisations were recommended for both (See Section 5.1).
- Seawater cooling is reducing the potable water demand for cooling water at one site.

4.3.4 Tips for Progressing Water Efficiency in a Large Entertainment Venue

Based on the findings from this project, these are the key tips to help target improved water efficiency in a large entertainment venue:

- Check tap and shower flowrates in bathrooms. Some sites have already successfully implemented shower flowrates as low as 6 L/min and tap flowrates as low as 3 L/min. This can be achieved reliably through retrofitting new shower fittings and pressure-compensated aerators in tap spouts. For fit outs with integrated shower designs, in-line technologies have also been successfully trialled. See Section 5.3 for more details
- Even after a retrofit of showers and taps it is recommended that flowrates be regularly checked as they have been found to increase gradually over time with wear at some sites. There are more details in Section 5.4.
- Installing water sub meters and tracking these at high resolution with flow monitoring is a key tool that will likely pay for itself by enabling rapid identification of leaks and losses that would have otherwise gone unnoticed for long periods of time. This is discussed in Section 5.1.
- Investigate the potential to reduce or eliminate hosing in kitchen areas, as discussed in Section 5.2.
- Check urinal settings as discussed in Section 5.5.
- Regularly check cooling tower conductivity as discussed in Section 5.6.

- Investigate the potential to optimise existing alternative supply (i.e. The addition of air handling unit condensate to existing rainwater tanks) to offset toilet/urinal water use, as discussed in Section 5.7.

4.4 Small Entertainment Venues

There are a wide variety of smaller scale entertainment venues, and three sites were selected to capture some of the variety in this segment (Table 4-7).

Small Entertainment A has a much lower water use than the other sites, though all sites have some similarities including:

- Water use largely based upon visitors using public toilets and basins
- Small kitchens/eateries
- Varying visitor numbers
- Regular functions and events

Table 4-7 Large Entertainment Venues Selected for Assessment

Site Name	Baseline Water Use (kL/day)	Average Visitors per day	Benchmark (L/visitor/day)
Small Entertainment A	0.2	50	4
Small Entertainment B	24.2	2985	8
Small Entertainment C	35	2759	13

No known industry water use benchmarks exist for these types of facilities. Small Entertainment C has a higher water usage per visitor due to potable water air cooling.

4.4.1 Average Water Use Breakup

A potable water use breakup is intended to represent a snapshot of current baseline use, unaffected by seasonal factors. It was developed from a combination of analysis of flow monitoring, meter reading records, site inspections and discussions with site staff. Figure 4-6 illustrates the percentage of area/end use across the three sites.

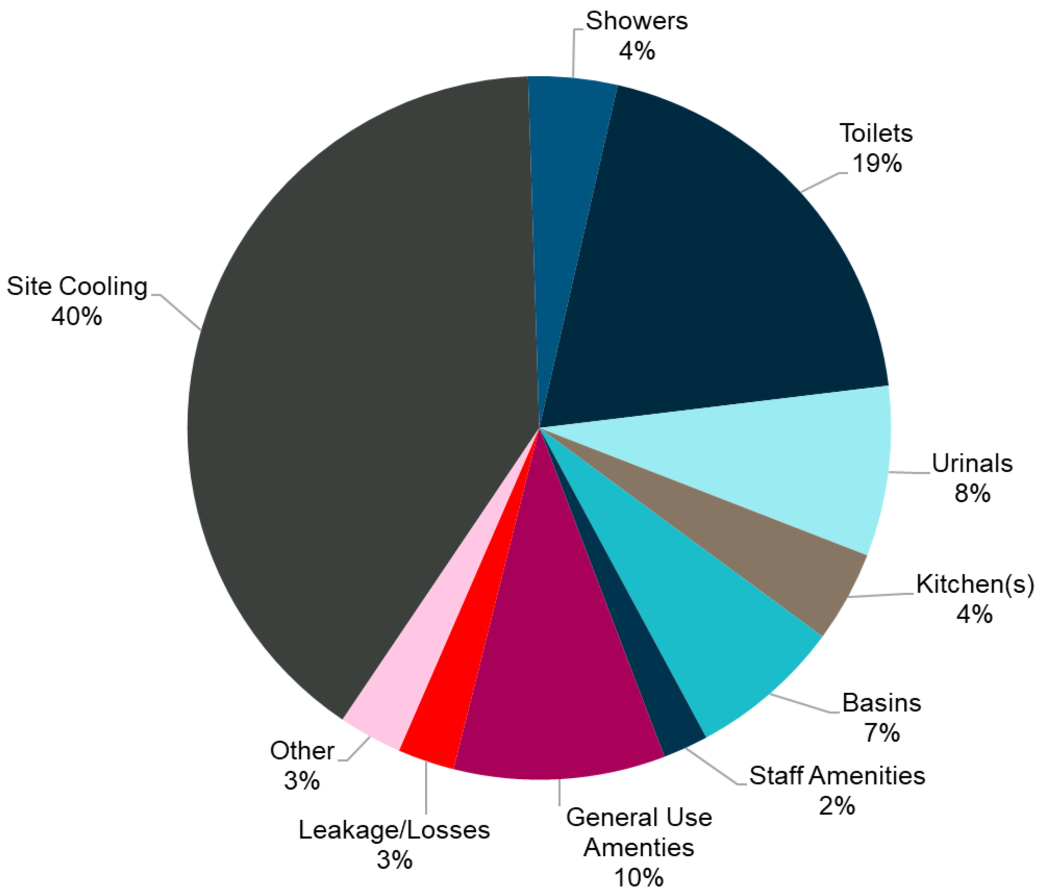

Figure 4-6 Potable Water Use Breakup by Area/End Use (%) – Small Entertainment Venues

Key points to note from this breakup are:

- Site cooling (40%) is the largest water end use, however this is skewed by cooling at one site.
- Toilets (19%), general use amenities (10%), urinals (8%) and basins (7%) make up large portions of water use due to the large number of visitors at these sites.
- Leakage/losses accounted for an average 3% of total water use across all sites. These attributed to toilet leaks, tank overflows and cooling tower losses. Common recommendations to mitigate these losses included regular tracking of submetering with flow monitoring (See Section 5.1).
- Kitchen water use averaged only 4% due to the irregular nature of catering events, however savings measures relating to cleaning and hose down practices were identified (see Section 5.2).
- For the purposes of this assessment 'Other' included end uses including general cleaning, end of trip facilities, and laundry areas.

4.4.2 Summary of Recommendations

Recommendations for potential water savings opportunities for each of the three sites are summarised in Table 4-8 and Figure 4-7 including percentage of baseline saved and payback period (years). Water savings recommendations have been ordered from highest percent of baseline usage to lowest.

Table 4-8 Saving Statistics by Recommendation Type – Small Entertainment Venues

Recommendation	% Baseline Water Usage	Payback Period (years)
Flow Monitoring for Optimisation	8.5%	1.8
Flow Regulation in Basin Taps	4.8%	0.4
Kitchen Hosing and Cleaning Practice Optimisations	1.7%	2.5
Urinal Sensor/Flush Adjustment	0.8%	0.5
New Alternative Supply System	35.1%	22.9

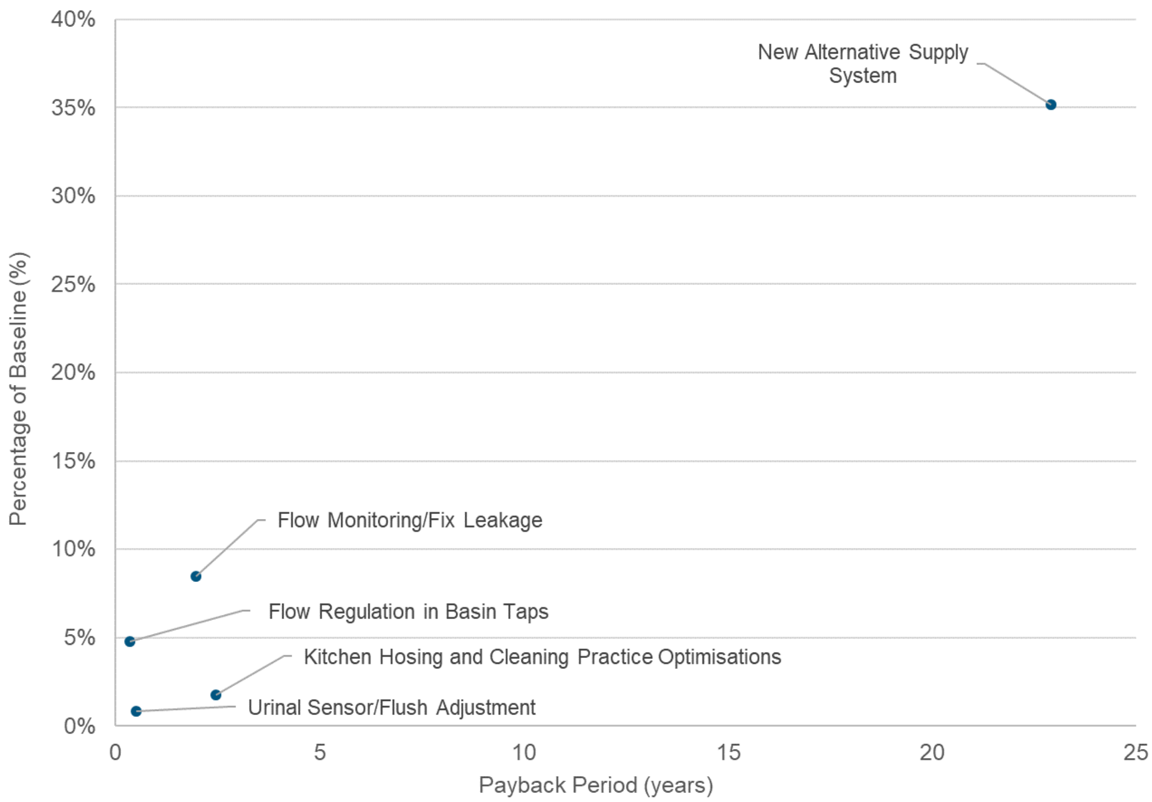

Figure 4-7 Small Entertainment Recommendations – Percentage of Baseline against Payback Period

Key points to note from this are:

- Flow monitoring provides the second highest average saving (8%) to baseline water use, with a relatively low average payback period (1.8 years). Optimisations include the rapid detection of toilet leakage. For further details see Section 5.1.
- Flow regulation in basin taps provided the third average saving (5%) to baseline water use, with a relatively low average payback period (0.4 years).
- Kitchen hosing/cleaning practice optimisations, investigation/fix of leaks and urinal sensor/flush adjustment have relatively low savings potential however are typically inexpensive improvements.
- The 'new alternative supply system' option shows a high saving per year (35%) however has a significantly high payback period (22.9 years) and is likely an unfeasible option for most sites. This is based off the addition of a rainwater tank installation at one site.

4.4.3 Existing Efficiencies

Notable existing efficiencies were observed during the site visits to each of the small entertainment venues. Key trends for existing efficiencies included:

- Two of the three sites had some level of water efficient fixtures in general areas (e.g. flow restrictors in basins and/or low flow showers), efficient kitchen fixtures (e.g. dishwashers and waterless woks)
- One site had sub-metering however improvements to tracking were noted (See Section 5.1)
- One site incorporated effective cooling practices via seawater heat exchange from the air handling systems

4.4.4 Tips for Progressing Water Efficiency in a Small Entertainment Venue

Based on the findings from this project, these are the key tips to help target improved water efficiency in a small entertainment venue:

- Check tap and (staff) shower flowrates in bathrooms. Some sites have already successfully implemented shower flowrates as low as 7 L/min and tap flowrates as low as 4 L/min. This can be achieved reliably through retrofitting new shower fittings and pressure-compensated aerators in tap spouts. For fit outs with integrated shower designs, in-line technologies have also been successfully trialled. See Section 5.3 for more details.
- Even after a retrofit of showers and taps it is recommended that flowrates be regularly checked as they have been found to increase gradually over time with wear at some sites. There are more details in Section 5.4.
- Installing water sub meters and tracking these at high resolution with flow monitoring is a key tool that will likely pay for itself by enabling rapid identification of leaks and losses that would have otherwise gone unnoticed for long periods of time. This is discussed in Section 5.1.
- Investigate the potential to reduce or eliminate hosing in kitchen areas, as discussed in Section 5.2.

- Check urinal settings as discussed in Section 5.5.
- Regularly check cooling tower conductivity as discussed in Section 5.6.

5 Recommended Focus Areas

These are areas that were identified as recurring opportunities relevant to multiple sites.

5.1 Metering and Flow Monitoring

5.1.1 Opportunity and Benefits

Installing water sub meters and flow monitoring is a key tool that will likely pay for itself by enabling rapid identification of leaks and intermittent or unexpected losses that would have otherwise gone unnoticed for long periods of time.

This can be achieved through having a plumber cut into pipes and install water meters (with pulse outputs) in key areas, and then attaching remote dataloggers to these pulse outputs - or trending the meters in an existing Building Management System (BMS). Examples are shown in Figure 5-1.

Flow monitoring of water meters is the most effective tool for high-quality water consumption analysis and leak identification. The interval data that flow monitoring provides enables a clear and accurate picture of site water consumption to be quickly ascertained and has a range of benefits, including:

- Clearly revealing losses, hidden leaks and anomalies in consumption.
- Enabling tracking and verification of recommended savings being achieved.
- Quickly alerting new or unexpected issues before costs or damage is incurred.
- Streamlining ongoing water management, reporting and maintenance for site staff and management.

Examples of issues observed (Figure 5-2) that could be highlighted with flow monitoring include:

- Constant discharge from the pool filters to drain as a result of a failed valve.
- Constant discharge to drain linked to constant pool top up, with water constantly overtopping the overflow drainage along the perimeter of the pool.
- Intermittent or constant tank overflows – common with wearing float valves or pressure imbalances.
- Cooling tower losses via overflow or other leaks.
- Excessive kitchen washdown consumption, leakage or equipment malfunction.
- Hot/cold water cross connections.
- Unreported bathroom leakage – especially toilet leaks.
- Excessive water feature top-up.
- Uncertainty about water supply to public spaces.

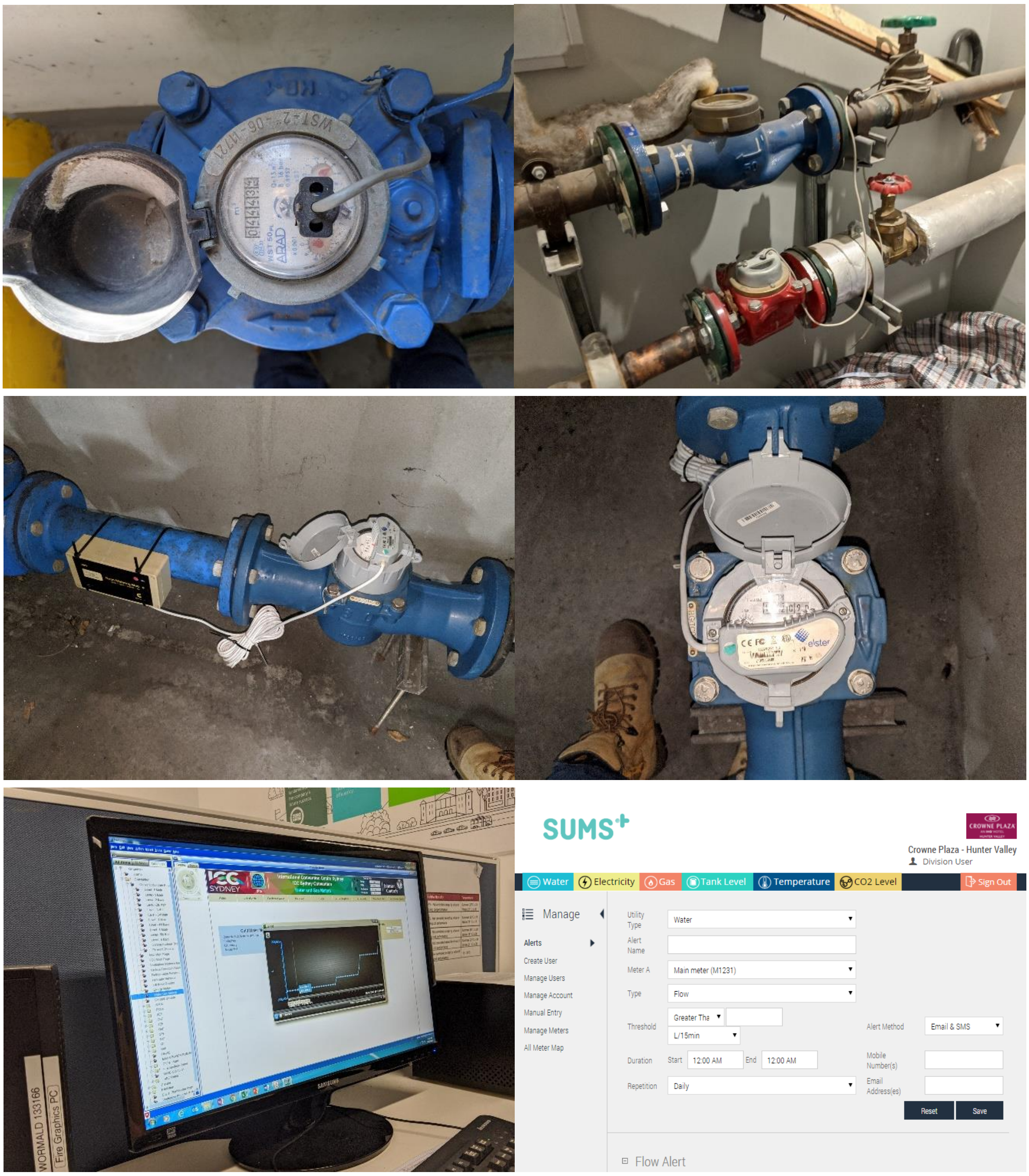

Figure 5-1 Examples of Wired in Meters, Remote Loggers, BMS and Logger Portal

Figure 5-2 Examples of Overflow, Leaks and Losses

The regular review of sub meter flow data can help highlight these anomalies, many of which would be difficult or impossible to track without this additional information. Examples of flow data graphs are shown in (Figure 5-3).

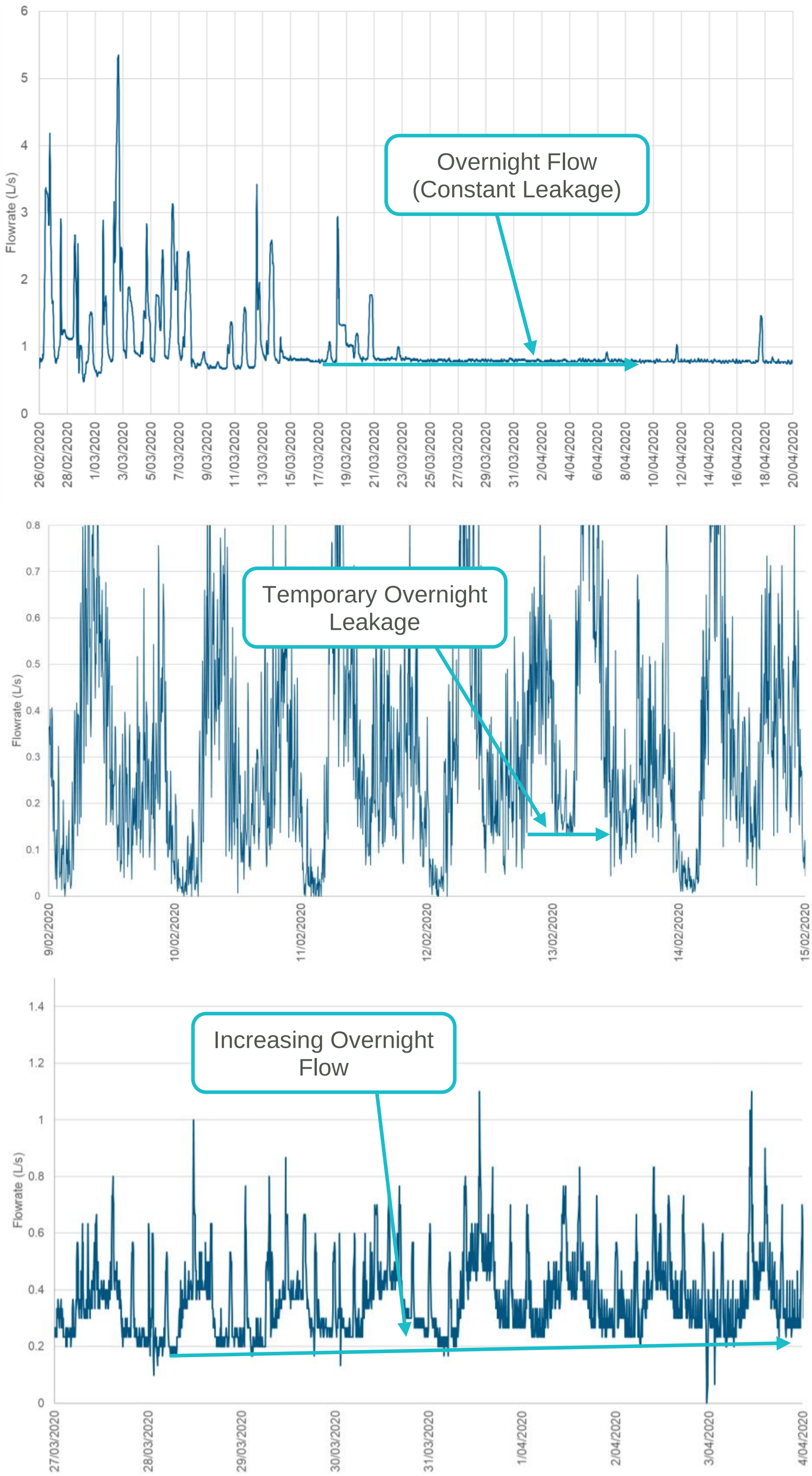

Figure 5-3 Examples of Flow Tracking Identifying Leakage/Losses

5.1.2 Technical Recommendations

- Monitoring of Sydney Water main meters is recommended to track overall water use
- Suitable sub-meter locations depend on what is feasible for each site's hydraulic system. Recommended locations include:
    - Makeup lines to cooling towers
    - Makeup lines to hot water heaters
    - Kitchen areas (hot and cold if required)
    - Tank outlets – especially for sites where water is intermittently pumped to a roof tank, a submeter on the outlet of that tank will provide much greater insight on water use throughout the building than tracking the main meters before the pumps
    - Cold water supplies to segments of the building (for example upper or lower sections, or east/west wings) – existing shutoff valves or pressure reduction valves may be in ideal locations.
    - Tenants – especially restaurants, commercial kitchens, laundries, gyms or tenants with their own cooling towers
    - Pools
    - General access bathrooms – for example in conference or lobby areas
    - Water features or irrigated garden areas
    - Potable makeup lines to any existing rainwater systems
- It is recommended that meters with pulse resolutions of 10 L/pulse or lower are used, and that these are monitored at a timestep of 15 minutes or less.
- It is recommended that the system is selected or configured to provide easy access to encourage frequent checking – with the ability to easily view daily totals and raw (e.g. 15 minute) consumption for multiple sub meters at a time. Remote access from off-site or mobile devices is an advantage to enable easy checking.
- Ideally a system is recommended that can be easily configured to provide tuneable alerts (for example email or sms) to inform staff – for example when water use has increased during a period of the day or week when consumption is normally low (such as early morning for cooling towers or kitchen areas).
- 'Cumulative alerts' are preferred to track overnight flows and not just peak values – note this can be a limitation of some BMS systems compared to dedicated water monitoring portals. As with all alerts, it is worth taking some care to set and tune the levels appropriately – to ensure that they trigger when needed, but do not alert excessively to wear out the attention of the applicable staff member. To this end, it is recommended that there is a simple system in place to allow staff to change alarm setpoints as regularly as is necessary. Examples of suggested alert settings include:

    - Alerting elevated meter flow for accommodation areas during off peak hours
    - Alerting unusually high overall use in a day – indicating a potential problem if there are no other unusual circumstances to explain the consumption
    - Alerting elevated sub meter flow from areas such as the pools or kitchens.
- If an existing BMS is to be used, it is necessary to ensure meters are connected, calibrated against actual meter readings, trended and added to the main interface – as this is often not the case for many water meters installed and 'connected' to a site BMS.

5.1.3 Barriers and Incentives

A notable finding from this project was that the use of water sub metering and flow monitoring was lower in the accommodation and entertainment venue segments than in many other commercial segments.

This may be due to difficulties with business cases - a common barrier to investing in metering and flow monitoring is that it is difficult to link the investment to a specific expected saving. For example, most sites would not expect that they have hidden water leaks and losses and so the investment could be perceived as redundant and therefore a low priority.

However, findings from close site investigations highlighted that:

- Leaks and losses appear to be relatively common – and these are likely to increase in frequency and magnitude over time as site assets continue to age, especially with the additional pressure variation in tall buildings. Some of these losses (such as pool losses, cooling tower losses or hot water leaks) also significantly impact energy consumption and chemical costs – others can present potential health and safety risks or a risk to asset damage.
- Due to the variety of water end uses at most hotel sites, site staff have no accurate means of quantifying potential savings or verifying achieved savings from water efficiency improvement projects without submetering and tracking.
- Site staff have limited ability to monitor and influence staff and contractor water use patterns (for example, kitchen cleaning or cooling tower management) without submetering and tracking. Kitchen cleaning is discussed in more detail in Section 5.2.

For these reasons it is recommended that all sites consider some level of investment in sub metering and flow monitoring as a foundational enabling technology for ongoing water management.

5.2 Kitchen Cleaning

5.2.1 Overview

Kitchen water usage across all sites averaged 5% of the total site water breakdown. The proportion of kitchen water usage was highest at large entertainment venues (15%) and Hotels (9%). A significant proportion of water usage within kitchens can be attributed to kitchen washdown procedures including floor cleaning. Other water usage within kitchens can be attributed to equipment washdown, surface cleaning, pot and dishwash machines, water cooled woks and general tap usage.

Floor cleaning practices varied between sites highlighting an inconsistency between perceptions of best practice requirements for kitchen floor cleaning and hygiene in kitchen areas. Many sites undertook floor cleaning with spray guns or nozzles, and a small number of sites utilised floor scrubbers and mopping to avoid hose use.

This variability was reflected in feedback form the SDP 'water efficiency workshop' – with site staff indicating that kitchen cleaning does appear to use large volumes of hot water (resulting in water and energy costs), particularly at sites which rely heavily on daily hosing.

It was noted that water consumption in kitchens and the style of cleaning can be difficult to influence due to:

- A lack of clarity on cleaning requirements and regulations, and what is optimal for hygiene – compounded by a wide variety of opinions from site staff and contractors.
- A lack of submetering and flow monitoring of kitchen water use at most sites.
- Challenges in observing and influencing contract cleaners that work overnight and have a high staff turnover (for sites where kitchen cleaning is subcontracted)
- Challenges in influencing kitchen staff habits and preferred practices (for sites where kitchen staff conduct cleaning).

These challenges are recommended as a focus area for further development and collaboration in the Sustainable Development Partnership. This could be achieved via a community of practice on kitchens by informally be created between member of the SDP to share learnings and best practice including:

  - Sub metering and monitoring to track flows and high usage areas
  - Experimenting with technology to provide upgrade to performance/cleanliness and water efficiency (e.g. floor scrubbers, vegetable tumblers, dishwashers)
  - Trialling changes to cleaning including floor, surface and plant/equipment

Some investigation was done as part of this project to provide some clarity and industry insights into cleaning requirements and risks and potential best practice. Findings of these investigations are discussed below.

5.2.2 Government Regulation and Guidelines

Guidelines from Safe Food Australia[2] do not specify a method of cleaning.

While hose connections are recommended in garbage storage areas (Standard 3.2.3 6.c), they are listed only as an example of a fitting 'likely to be needed' (Standard 3.2.3 12.1.a) in kitchen areas.

The Standard instead focusses on ensuring that kitchen floors are designed and constructed in a way that is appropriate for the activities conducted on the food premises, including (Standard 3.2.3 10.2.a):

- being able to be effectively cleaned,
- being unable to absorb grease, food particles or water,
- being laid so that there is no ponding of water, and
- to the extent that is practicable, being unable to provide harbourage for pests.

It is worth noting that ponding of water is identified as a health risk. It could be argued that hosing in kitchens without a perfect fall of all floor areas to drain presents a higher risk (i.e. to slips, trips and falls) than alternative methods which do not leave ponding of water.

Engagement with commercial cleaners specialising in commercial kitchens confirmed that this is a correct interpretation of the Standard and that there is no specific requirement on the cleaning method or frequency. Similarly, some of the commercial kitchen areas at sites in this project confirmed that there is no hosing conducted of floors – with one site having no hose taps installed at all in general areas.

5.2.3 Staff Training

Various Vocational Training Institutions were contacted for comment on cleaning practices taught to kitchen staff in training but no comments were provided to date.

Curriculum documents for kitchen staff[3] and cleaners[4] contain the requirement on reducing negative environmental impact in kitchen cleaning. For example, the curriculum of Certificate II in Hospitality states that an essential outcome of the training is to "reduce negative environmental impacts through efficient use of energy, water and other resources".

5.2.4 Benefits and Limitations of Hosing

Commercial cleaners and site staff indicated that a key reason for the popularity of hosing is the ease of access to hard to reach places such as underneath ovens and cookers. These areas are generally more difficult to reach due to tight space access, and they accumulate debris and grease.

---

[2] Safe Food Australia - A guide to the Food Safety Standards, Standard 3.2.3 Food Premises and Equipment, https://www.foodstandards.gov.au/publications/Pages/safefoodaustralia3rd16.aspx

[3] https://training.gov.au/Training/Details/SITHKOP101
[4] https://bot.edu.au/course/cpp30316-certificate-iii-in-cleaning-operations/?portfolioCats=60

Hosing the area appears to be a quick solution as the cleaner can use the water to ‘sweep’ the debris towards the drain with the stream of water from the hose. As a result of these areas, it is common for a hose to be used over all floor areas and some benches in many kitchens.

Examples of hoses observed in kitchens are shown in Figure 5-4.

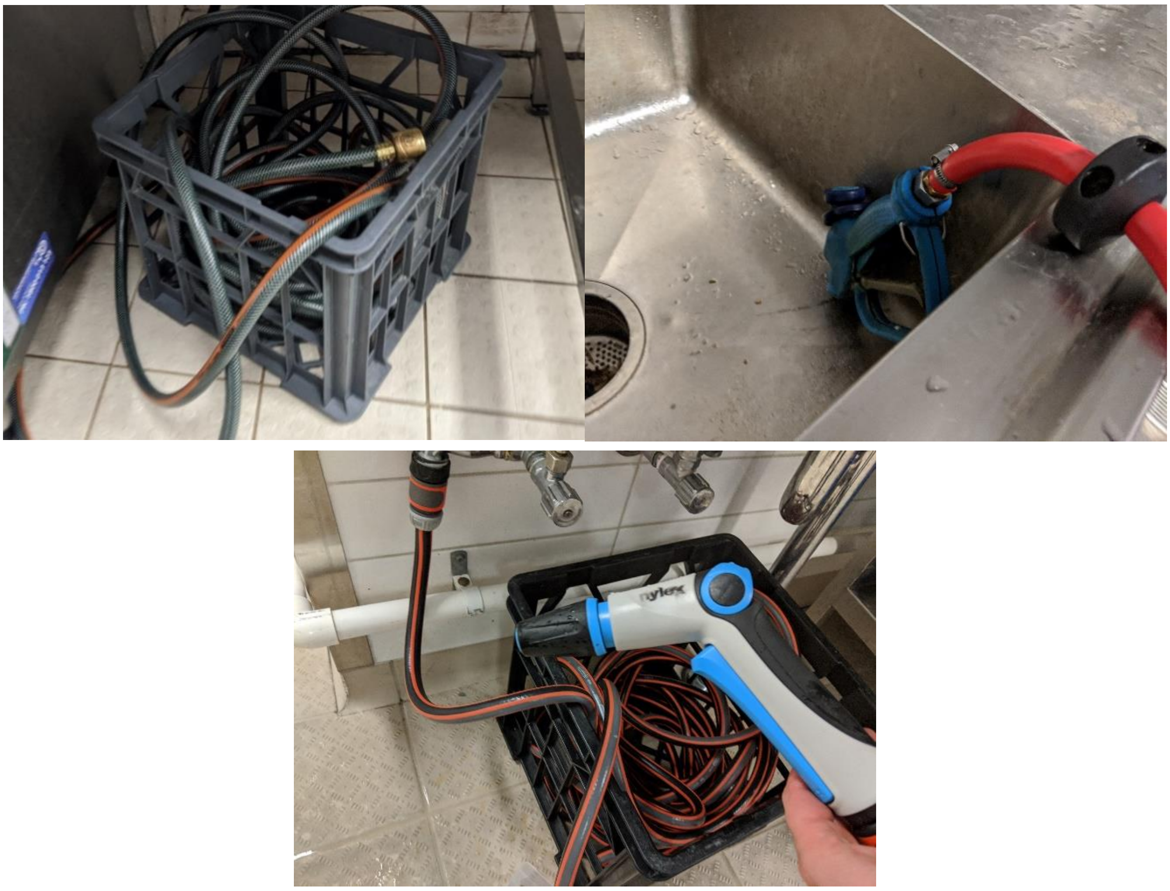

Figure 5-4 Examples of Kitchen Hoses

However, there are several limitations of this approach. For example:

- The large volumes of water use result in wet areas and pooling wherever floor surfaces are not perfectly flat or falling to drain consistently. This represents a slip hazard and a potential hygiene risk unless mopped dry – which takes additional time and may not be done by some cleaning staff.
- Hosing can easily damage kitchen equipment – especially electrical components. This poses significant safety risks in addition to replacement cost and operational disruption.
- Hosing sends most floor waste to drain instead of food waste disposal streams. This can cause clogging in drains and sewer pipes from solids and greases flushed in. Hosing should not be done if there isn’t a downstream triple interceptor grease trap, but even so, drainage pipes with large volumes of water can have an impact on grease traps (where present) and downstream sewer systems.

For these reasons it appears that alternative floor cleaning approaches without resorting to hosing are increasingly being specified in commercial kitchens.

Site staff indicated that floor hose down practices had been removed from several kitchen areas due to the excessive use of water and issues with water ingress on electrical equipment, causing damage to equipment and downtime reducing production efficiency.

5.2.5 Kitchen Cleaning Alternatives

BMT contacted four commercial cleaners specialising in commercial kitchen cleaning and progressed conversations with kitchen managers at selected sites investigated as part of this project.

Bench cleaning for most sites typically includes a dry wipe, detergent spray/wipe to remove residue, and a wipe to dry. Cleaning benches with hoses tends to be risks for equipment and wetting spots that are difficult to dry.

Floor cleaning is often done to a high standard without hosing - using mops and buckets, floor scrubbers, dedicated pressure washers and steam cleaning. These are detailed below.

In order to manage contractors, a common theme was the importance of working with the contractor cleaner and to set mutual agreeable standards, to ensure cleaning undertaken safely and to a high standard. This is ideally enforced via regular monitoring by site when cleaners are undertaking cleaning duties. Period safety and quality assurance walk-throughs would also be undertaken with management and cleaning contractors.

Bucket cleaning methods for different floor types typically include:

- Tiled floor: a broom to sweep up material followed by a mop and squeegee. This typically involves a mop with cleaning chemicals and a hot water cleaning mop to follow.
- Epoxy floor: a broom followed by an application of floor cleaning chemical and water which is then scrubbed with a stiff broom. Clean water is then applied followed by a squeegee to dry the floor. Typically, water is placed on the floor using a bucket rather than a hose. This assists with reaching dirt and grime from hard to reach places such as under benchtops.

Figure 5-5 Examples of Buckets, Squeegees and Mops Observed

Scrubbers are integrated units designed to clean floors with the highest possible effectiveness (Figure 5-6) – typically these units are designed to achieve the following in a single pass:

- Spray small volumes of water mixed in exact ratios with appropriate chemicals,
- Make use of an optimised scrubbing design,
- Pick up dirt and debris for solid waste disposal (instead of washing into drains for clogging)
- Dry up the remaining water by scrubbing or sucking

These have different specifications and can suit a wide range of kitchen conditions, and water use is optimised and very low.

Barriers to the wide use of scrubbers include high cost (compared to hosing fixtures), ability to access tight spaces, and perceptions of potential damage to the kitchen fixtures from impacts – especially to pipework and cabling. A manager from the SDP mentioned that floor scrubbers could be problematic to get into tight spaces and under benches, and potentially cause damage pipework and cabling that are close to the floor.

Figure 5-6 Examples of Kitchen Floor Scrubbers [5,6]

Pressure cleaning with a rotary head combines high pressure water spray and rotary scrubbing. The cleaning disk sucks to the floor via a vacuum hose, and therefore confines the water spray inside the disk with little splash outside (Figure 5-7) – an advantage over typical pressure washing guns.

The capital cost is lower for these units than floor scrubbers, though for some floor types it could lead to wear with regular use. For this reason, some sites are known to use these every fortnight for a 'deep clean'.

[5] http://carpet-cleaning-equipment-toronto.com/home/cleaning-kitchen-floors-rotowash
[6] https://www.duplexcleaning.com.au; https://www.kaercher.com/au/professional/industrial-floor-cleaners-scrubbing-machines.html

Figure 5-7 Pressure Cleaner with Rotary Head[7]

Steam cleaning uses a jet of steam through a jet or a mop pad (Figure 5-8) to loosen dirt off the floor with heat and minimal water. This provides an option for chemical-free sanitising and is highly effective on grease.

It is not suitable for unsealed floors, or floorings that are sensitive to hot water, and adhesive tiles with lifting corners due to the high temperature of the steam.

Figure 5-8 Steam Mop

[7] https://www.kennards.com.au/rotary-cleaner.html

5.2.6 Hosing Upgrades

For kitchens where the journey to cleaning without hoses may take some time and engagement, there are opportunities to make some rapid reductions to water use by upgrading the washdown guns attached to the existing hoses.

Flowrates of a washdown hoses were recorded from 12 - 25 L/min. Installing an efficient washdown gun has the potential to significantly reduce water use of hosing.

Depending on kitchen needs this could be achieved through a design that provides a similar cleaning function (with a variable spray pattern from wide to narrow) at a lower flowrate (~8 L/min).

However in many kitchens where strong spray force is preferred (and there is little need for the broader spray patterns for gentle wetting) the use of these guns with an appropriately selected solid jet nozzle can often provide a more effective water spray, notable by a tighter stream with a longer throw and higher impact force, even at a lower flowrate.

Commercial grade spray guns can be ordered with a standard threaded fitting on the outlet that is designed to take a water jet nozzle (Figure 5-9). An ideal ‘solid jet’ nozzle can be selected from on-site testing to provide the optimum balance of spray force and flowrate for the kitchen space.

This has been found in many applications to reduce hosing time even at a lower flowrate due to the much higher effectiveness of the tighter stream.

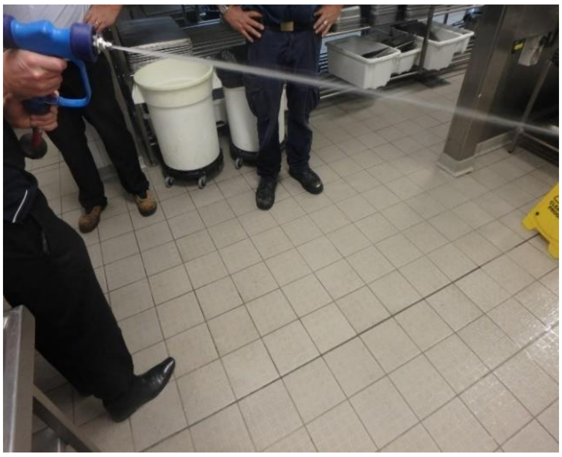

Figure 5-9 Threaded Washdown Gun and Solid Jet Nozzle Installed in Another Kitchen

5.3 Shower and Tap Flowrates

Showers and taps with some flow regulation installed were already found to be successfully implemented at all sites. Showers were typically measured between 7-10 L/min, and basin taps between 5-9 L/min. Higher flow fittings with flows of 12 to 16 L/min were found mixed in with the lower flow fittings. Without any flow regulation shower flowrates could typically be 17-30 L/min and basin taps can range between 15 to 25 L/min at normal mains pressures – these flowrates were not observed anywhere in bathrooms.

Flow regulation at lower flowrates can be achieved reliably through retrofitting new WELS rated shower fittings and pressure-compensated aerators in tap spouts (Figure 5-10).

For fit outs with integrated shower designs, in-line technologies have also been successfully trialled by some sites. Best practice flow rates have already been tested and partially implemented by some sites - with showers and basin taps are 6 L/min and 3 L/min respectively. Anecdotal feedback suggests that this may be a practical limit with current technology performance for showers. Flowrates as low as 1.5 L/min have been suitable in basin taps at some sites (not assessed in this project), however at these low flowrates basin taps are already a relatively minor proportion of total site consumption – so the additional cost saving for pushing for lower basin flows is limited.

For most sites were customer satisfaction is a high priority, it is recommended that a pilot test be undertaken (for example in a small number of showers/taps across rooms on different levels/general use areas), to ensure that there are no unexpected issues likely to impact guest satisfaction.

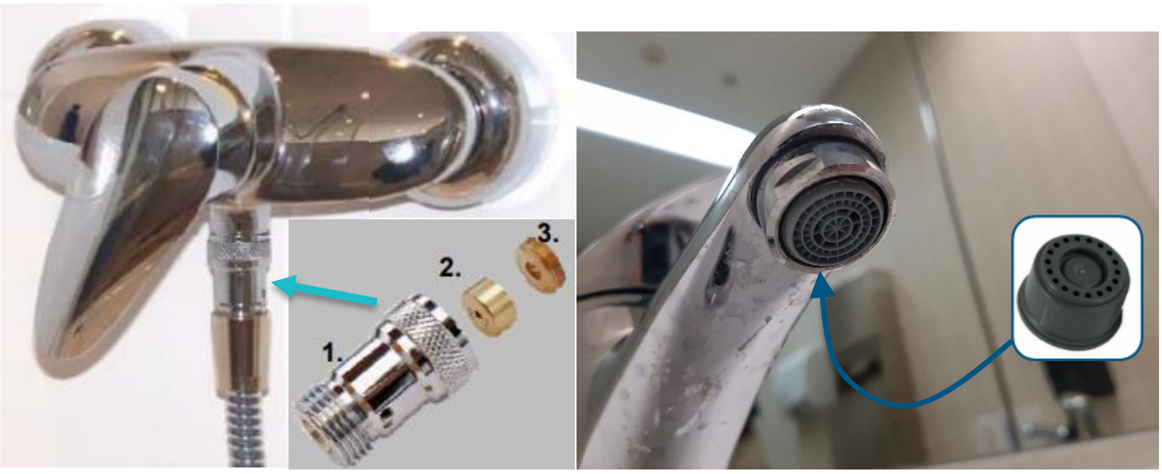

Figure 5-10 Example of In-line Shower Fitting and Tap Fitting and Aerator with Low Flow Version (Insert)

5.4 Proactive Bathroom Maintenance

Minor leaks are an ongoing challenge for most sites due to the large numbers of fixtures. A key factor influencing water consumption is how quickly these are identified and repaired.

Many sites already have a streamlined reporting system that allows staff (including cleaners) to easily report minor leaks. However, as with many sectors, it can be difficult to predict the consistency with which staff will report smaller leaks. Accumulated leakage can easily occur with delayed repair caused by inconsistencies in the spotting and reporting of leaks by staff and guests.

Flow monitoring (discussed in Section 5.1) is a recommended tool to provide more visibility in tracking leakage – with a key benefit that this enables tracking of intermittent and variable leakage.

Similarly, proactive bathroom checks by maintenance staff specifically looking for minor leaks can help rapidly identify leaks early. Better still, preventative maintenance would involve regularly changing over wearing parts (such as toilet flush seals and fill valves and tap washer) before they wear out and start to fail – though this approach appears to have limited penetration to date in accommodation and entertainment sectors.

For most sites it is recommended that targeting checking of bathroom areas be conducted by site staff or contractors at regular intervals to proactively note minor leaks or leaks that may not have been noted by other staff or guests.

It is also recommended to check flowrates for basin taps and showers, to identify when wear has caused flowrates to increase and replacement is necessary. For example, the flowrate test could be as simple as timing how long it takes to fill a 1 litre jug – for example a shower would be due for replacement if it fills 1 litre in 7 seconds or less (equivalent to 8.5 L/min).

5.5 Urinal Sensor Alignment and Flush Settings

Urinals are common in staff and publicly accessible bathrooms, and sensor-triggered are the most common technology. Typical issues that can cause water inefficiency with these units can be fixed at a low cost. This includes optimising urinal sensor alignment and optimising the settings controlling the frequency and volume of flushing.

Misaligned sensors cause the urinal to flush more frequently than necessary, as they are triggered as people walk past rather than only being triggered by those who walk up to the stalls. Typically, most sensors are set up to have the sensor 'slots' to run parallel to the urinal wall, however some sites were found to have sensors aligned in a way that is being triggered by anyone walking past - causing unnecessary flushes (Figure 5-11).

Figure 5-11 Example of Misaligned Urinal Sensor

These slots can be easily aligned via turning the sensor located on the ceiling (Figure 5-12).

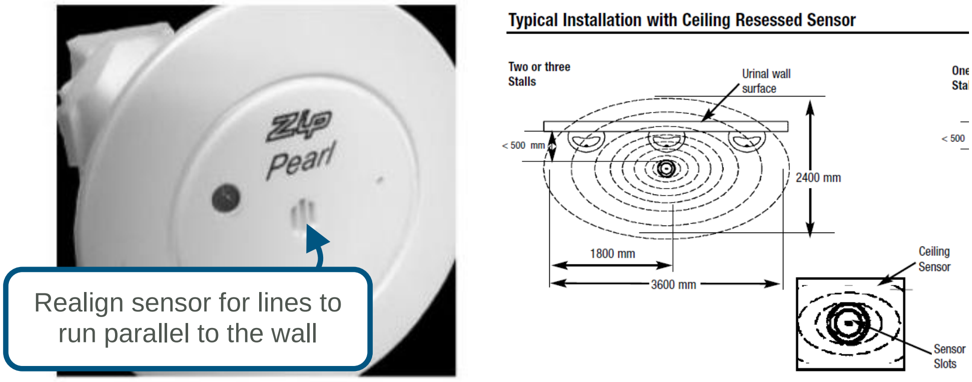

Figure 5-12 Zip Sensor Realignment

Adjusting the flush settings is possible on many common models, and this can also provide water efficiency gains. Flush settings can be set to maximise ‘flush delay’ to increase the length of time between flushes in busy periods, and reduce ‘flush time’ to tune the volume of each flush to a minimal amount needed to clean the urinal.

Some sites had long flush times (10 seconds or more) however, it is recommended that a flush time of less than 5 seconds would be appropriate for most applications – depending on the design of the urinal. These can normally be adjusted on the sensor unit.

5.6 Cooling Tower Bleed Set Point Optimisation

Bleed is necessary from cooling towers to keep the remaining water from accumulating impurities (and eventually starting to scale surfaces) as the majority of water is evaporated. A setpoint is set in the controller by the staff or contractor managing the cooling tower at which system sends water to drain. A low setpoint sends more water to drain than a high setpoint

The Better Buildings Partnership (2018) recommended a bleed setpoint of 1700 microsiemens. This electrical conductivity level ensures a high level of overall water efficiency without compromising water quality or overall system performance.

For sites with a lower setpoint than this it was recommended that a change to the bleed set point be discussed with the site cooling tower contractors to determine if this change would be suitable with current dosing chemical parameters.

Where a low conductivity (for example less than 70% of the bleed setpoint) is observed, this is likely an indicator that there is leakage occurring from the system – and it is recommended that overflow and drain points be checked for unintentional flow.

Figure 5-13 Examples of Cooling Tower Control Panels

5.7 Optimisations to Existing Alternative Supply System

The potential for a significant impact on water use through cost effective use of alternative water sources depends on a range of factors specific to the layout of each site – though in general there were no opportunities for retrofitting a new system to a site identified with a payback period of under 20 years.

Some sites already have rainwater harvesting or wastewater reuse systems in place that are supplying toilet flushing or irrigation in selected areas – and there were potentially cost effective recommendations to improve the yield from these systems through connecting additional sources and end uses.

Additional sources could include:

- Rainwater from additional roof areas or drain points
- Air handling unit condensate (discussed below)
- Future off-site sources if a non-potable water network were to become available in the precinct

Cooling towers were proposed for multiple sites as a suitable end use for rainwater in addition to toilet flushing.

Air handling unit condensate has been used as an alternate water source in Australia and around the world, but it is relatively uncommon.

Each of the air handling units in an air conditioning system produces an (unknown but potentially significant) quantity of condensate water as moisture from the air. This is generally very clean water that has condensed out of the air onto the coils as the humidity is reduced, and normally drains to sewer as shown in Figure 5-14.

Figure 5-14 Air Handling Unit Condensate Drain Lines

This water could be used for toilet or urinal flushing or even irrigation or cooling tower makeup.

Typically, further consideration will need to be given to diverting the drain lines from the air handling units to existing infrastructure or into nearby downpipes, or alternatively into small sump, for direct pumping into a tank for reuse in cooling towers or toilet/urinal flushing.

There would also need to be some consideration of managing water quality – condensate is generally very clean though it may be necessary to manage the risk of potential contamination (such as from cleaning chemicals).

For a site where it appears that it should be relatively easy to connect condensate drain lines to a storage to supply toilet flushing or cooling tower makeup, it is recommended that water sub meters be installed on condensate drain lines in the first instance to quantify the volume of water potentially available.

5.8 Cost Savings Opportunities – Sewer Discharge Factor Revision

While not a water saving opportunity, a review of discharge factors can represent a significant cost saving.

Each business site has a discharge factor applied on Sydney Water bills (Figure 5-15) - this factor represents the proportion of potable water supplied to the site that is assumed to be sent to sewer, and therefore incurs an additional charge – $1.17/kL for each kilolitre of water used by the site, but multiplied by a set percentage (typically from 50-100%).

For sites with a significant proportion of water being evaporated in cooling towers, it may be possible to justify reducing this factor – for example using submeter records as evidence.

Customer information

- We're securing the future of Greater Sydney's water supply. Water usage charges have increased from $2.11 to $2.24 a kL as water is now being supplied from the Sydney Desalination Plant. The Independent Pricing & Regulatory Tribunal (IPART) sets our prices. For more information, visit **sydneywater.com.au/ourprices**.
- We've introduced water restrictions to help save water. To find out what you can and can't do, visit **sydneywater.com.au/restrictions**.
- A discharge factor of 95% has been applied to your property.

Figure 5-15 Discharge Factor on Water Bill

6 Further Investigation

This project was intended to identify key outstanding water efficiency opportunities from available information and site inspections.

However, it is likely to be possible for further water savings to be identified with further investigation in the future. In order to help target future work, the following areas recommended for further investigation are suggested:

- Closer assessment of hidden leaks and losses in water use patterns based on sub meters and flow monitoring data as suggested in Section 5.1,
- Increased engagement with kitchen cleaning stakeholders to find a recommended path to drive or effectively incentivise more efficient kitchen cleaning practices (ideally supported with flow monitoring to verify savings),
- Engagement with accommodation room cleaning staff to look for opportunities to optimise cleaning procedures,
- Assessment of more sites to form a larger sample of properties and findings.

Brisbane
Level 8, 200 Creek Street, Brisbane QLD 4000
PO Box 203, Spring Hill QLD 4004
Tel +61 7 3831 6744 Fax +61 7 3832 3627
Email brisbane@bmtglobal.com
Web www.bmt.org

Denver
8200 S. Akron Street, #B120
Centennial, Denver Colorado 80112 USA
Tel +1 303 792 9814 Fax +1 303 792 9742
Email denver@bmtglobal.com
Web www.bmt.org

London
International House, 1st Floor
St Katharine's Way, London E1W 1UN
Tel +44 20 8090 1566 Fax +44 20 8943 5347
Email london@bmtglobal.com
Web www.bmt.org

Melbourne
Level 5, 99 King Street, Melbourne 3000
Tel +61 3 8620 6100 Fax +61 3 8620 6105
Email melbourne@bmtglobal.com
Web www.bmt.org

Newcastle
126 Belford Street, Broadmeadow 2292
PO Box 266, Broadmeadow NSW 2292
Tel +61 2 4940 8882 Fax +61 2 4940 8887
Email newcastle@bmtglobal.com
Web www.bmt.org

Northern Rivers
5/20 Byron Street, Bangalow 2479
Tel +61 2 6687 0466 Fax +61 2 66870422
Email northernrivers@bmtglobal.com
Web www.bmt.org

Perth
Level 4, 20 Parkland Road, Osborne, WA 6017
PO Box 2305, Churchlands, WA 6918
Tel +61 8 6163 4900
Email perth@bmtglobal.com
Web www.bmt.org

Sydney
Suite G2, 13-15 Smail Street, Ultimo, Sydney, NSW, 2007
PO Box 1181, Broadway NSW 2007
Tel +61 2 8960 7755 Fax +61 2 8960 7745
Email sydney@bmtglobal.com
Web www.bmt.org

Vancouver
Suite 401, 611 Alexander Street
Vancouver, British Columbia V6A 1E1 Canada
Tel +1 604 683 5777 Fax +1 604 608 3232
Email vancouver@bmtglobal.com
Web www.bmt.org