

BASIX Water Savings Monitoring for 2010-11

Sydney Water

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Glossary

ABS – Australian Bureau of Statistics.

BASIX Benchmark – The “baseline” consumption for a dwelling against which BASIX measures savings. It is calculated by multiplying the pre-BASIX average NSW potable water consumption from the residential sector (247.5 litres of potable water per person per day) by the assumed number of occupants of the dwelling. The latter is based on the average number of occupants by dwelling type, number of bedrooms and location, calculated using data from the 2001 Census.

BASIX certificate – document specifying the sustainability measures that the proposed development will install to meet BASIX requirements for water savings.

BASIX Target – minimum reduction requirement for BASIX dwellings. The BASIX Target for water in Sydney Water’s area of operation is 40% less than the BASIX Benchmark.

BASIX Water Score – the dwelling’s estimated percentage potable water savings relative to its BASIX benchmark as estimated by the BASIX tool based on the sustainability measures nominated. The BASIX Water Score must be a minimum of 40 for a dwelling to satisfy BASIX requirements.

EP&A – NSW Environmental Planning & Assessment Act 1979.

Multi-unit dwellings – a dwelling with one or more dwellings or buildings above or below it, such as flat, unit or apartment.

Single dwelling (BASIX definition) – a dwelling which is separated from all other dwellings and other buildings (excluding a garage or carpark) by at least 0.5m.

Target consumption – the potable water consumption based on the benchmark consumption and the target reduction of 40%.

Telephone sample – the BASIX compliant Sydney Water customers who participated in the telephone recruitment survey for the purposes of the BASIX Monitoring Project.

Executive summary

BASIX, the Building Sustainability Index, is a planning policy requiring all new houses and residential units to be designed to use up to 40% less potable water and emit up to 40% fewer greenhouse gases than the average NSW dwelling. The BASIX policy is one of the NSW Government's key initiatives in promoting a water and energy efficient future for New South Wales.

To ensure that BASIX is implemented as intended and to its full potential, Sydney Water and the Department of Planning and Infrastructure are undertaking an in depth monitoring study under a data sharing agreement. The monitoring study will be conducted in several stages including analysis of compliance trends, water savings and on-ground site verification.

Sydney Water has prepared the BASIX Water Savings Monitoring Report to present the findings of Stage 2 of the BASIX monitoring study. Stage 2 involves monitoring the actual water savings of occupied BASIX dwellings using metered potable water consumption to determine whether dwellings are meeting their water reduction targets.

Results show that BASIX dwellings are performing close to the 40% reduction target. Over the past four financial years from 2007-2008 to 2010-11 the sample of BASIX dwellings have saved 40.6%, 37.6%, 35.8% and 36.3%, respectively. The apparent downward trend in savings that was previously observed is likely to have been due to one-off factors and savings appear to be stabilising at about 36%. The 5% trimmed mean, which removes outlying observations, was 40.5%.

This is the fourth year that the BASIX water consumption monitoring has been reported. The BASIX water savings will be monitored and reported on an annual basis using the current framework. Each year the BASIX Water Savings Monitoring Report will be updated, replacing previous versions.

Introduction

In 2004 the NSW Government introduced BASIX, the Building Sustainability Index, a key planning policy requiring all new houses and units to be designed to use less potable water and emit fewer greenhouse gases. Reduction targets of up to 40% less water use and 40% fewer greenhouse gas emissions than the average NSW dwelling were set by BASIX.

BASIX was introduced in stages, commencing on 1 July 2004 for single dwellings in Sydney. In 2005, all single dwellings and multi-unit dwellings in NSW were incorporated into the scheme, and in 2006, BASIX was expanded to include renovations.

BASIX is administered under the Environmental Planning and Assessment Act 1979 and is managed by the NSW Department of Planning and Infrastructure. BASIX was developed in consultation with industry groups, local government and utilities to be flexible, adaptable and responsive to each new home. BASIX avoids prescriptive measures and actions that do not result in a measurable reduction in water use or greenhouse emissions.

BASIX is implemented through an interactive online assessment tool. The details of the proposed new dwelling, including the proposed water saving measures are entered into the tool. The tool calculates the potable water use and compares this against the BASIX Benchmark consumption. The results are expressed as the percentage saving relative to this benchmark, this is expressed in terms of the BASIX Water Score. The Water Score needs to be at least 40 for a dwelling to be BASIX compliant.

The BASIX Benchmark against which savings are calculated is based on the pre-BASIX average residential consumption in NSW of 247.5 litres per person per day. To calculate the BASIX Benchmark for a proposed new dwelling, this number is multiplied by the assumed number of occupants. The latter is based on the dwelling type, number of bedrooms and location. This is converted into an average number of occupants using data from the 2001 ABS Census on the average number of occupants by dwelling type, number of bedrooms and location.

Compliance with BASIX is checked as part of the building approvals process. All BASIX commitments are documented on a BASIX certificate and submitted as part of the dwelling's development application. The BASIX commitments must be fulfilled and checked by the principal certifying authority (building certifier) before the final occupation certificate is issued to the dwelling.

Background

The BASIX policy is one of the NSW Government's key initiatives in promoting a water and energy efficient future for NSW. As with any other regulatory policy, the challenge with BASIX is to ensure that it is implemented as intended and to its full potential. To ensure that the outcomes of BASIX are in line with the desired outcomes, Sydney Water is working with the NSW Department of Planning and Infrastructure on an in depth monitoring study.

The BASIX dwelling data, collected online as part of the application process, is stored in a database, providing detailed information on new housing stock design and location. This information has been fundamental to the BASIX monitoring study.

BASIX is being monitored in 3 key stages:

Stage 1: BASIX compliance trends

BASIX certificates were analysed by the Department of Planning and Infrastructure to determine the water, energy and thermal efficiency measures being nominated to meet the BASIX targets. The program commenced in 2006 and the outcomes to date are outlined in the *2004-05 Outcomes BASIX Ongoing Monitoring Program*, *BASIX 2005/06 Snapshot* and the *2005-08 Single Dwelling Outcomes BASIX Ongoing Monitoring Program* available on the Department of Planning's website.

Stage 2: BASIX water savings

Sydney Water is monitoring the metered potable water consumption of occupied BASIX dwellings to determine whether dwellings are meeting their water reduction targets. Analysis of the BASIX savings will be carried out on an ongoing basis to determine whether water savings are maintained and the effectiveness of specific compliance measures. This report presents the results of the monitoring study to date.

Stage 3: BASIX on-ground truthing

Sydney Water conducted site inspections on a sample of occupied BASIX dwellings to identify whether the water savings of BASIX (Stage 2 results) are being influenced by the installation, operation and use of the BASIX compliance measures. A total of 475 occupied BASIX homes were inspected to measure and test water efficiency and BASIX compliance. The information collected will help clarify whether the BASIX savings will be maintained in the long-term.

The findings of Stage 3 were reported separately in 2011.

Scope of this report

The purpose of this report is to present the results of the Stage 2 monitoring program. The report covers the water savings analysis for 2010-11 and results to those reported earlier for 2007-08 to 2009-2010 as reported previously, see Sydney Water (2009,2010,2011). Note this report is concerned with savings by single dwelling only. The savings by multi-residential dwellings will be analysed and reported separately.

Method

Sydney Water and Department of Planning and Infrastructure have established a data sharing agreement to assess the effectiveness of the BASIX policy. The Department of Planning and Infrastructure provides the BASIX dwelling information such as address and BASIX Benchmark, BASIX Target and BASIX Water Score information for each dwelling. Sydney Water matches this data with its billing database to analyse the consumption of these dwellings.

A number of challenges were encountered in determining which properties to include in the analysis. If a BASIX certificate exists for a particular property address, this does not constitute confirmation that the dwelling has been completed and occupied and can be included in the analysis. For dwellings on new sites Sydney Water's property database can be used to confirm if a dwelling has been completed. However, the exact date of occupation in particular remains hard to determine. However, in the case of new dwellings built on existing sites (knock-down rebuilds), even determining if the project has gone ahead is problematic, let alone determining when it was completed.

To overcome these challenges, a telephone survey of addresses with BASIX certificates was conducted to confirm if the dwelling had been completed and if so, when it was occupied. In this report we have also made use of the completion receipt to confirm if a BASIX application has been completed and can be included in the analysis. This information was previously unavailable which is one of the reasons why the telephone survey was implemented. The discussion below outlines the sample selection process in more details.

Sample selection

Three telephone surveys of addresses with a BASIX certificate have been carried out. The first was in April 2008, the second in February 2009 and the last survey was in June 2009. Over the course of these three surveys a total of 3,845 interviews were completed. Of the 3,845 properties surveyed, 2,861 qualified for inclusion in the analysis of 2010-11 savings. The main criteria for inclusion are that the dwelling was completed and occupied before July 2010 and meter reading data covering the full period from 1 July 2010 to 30 June 2011 was available. A detailed description of the survey method and criteria used to determine if a property qualifies for inclusion in the analysis for a particular year can be found in Sydney Water (2009, 2010, 2011).

The BASIX database now also includes information on the date a completion receipt has been submitted for a dwelling. If a submission date is available then the project must have gone ahead and been completed. This data therefore provides an alternative method to the survey approach to identify completed BASIX properties.

Completion receipt dates were used to identify additional properties that can be included in the analysis. Properties with receipt submitted prior to July 2010 which had meter reading data covering the full period from 1 July 2010 to 30 June 2011 were included in the analysis. Using the completion receipts an additional 2,433 properties were identified that could be included in the 2010-11 sample. Together with the 2,861 properties identified through the telephone survey this gives a total sample size for 2010-11 of 5,294 properties.

Table 1 shows sample sizes for 2007-08 to 2010-11 together with some basic sample characteristics, namely the average BASIX benchmark, the average number of bedrooms and the

average number of occupants, the proportion of the sample with a reticulated recycled water supply (dual reticulation) and the year the BASIX certificate was issued.

Table 1 Sample sizes and sample characteristics

	2007-2008	2008-2009	2009-2010	2010-11
Sample size	837	1,392	2,479	5,294
Average BASIX benchmark consumption (litres/dwelling/day)	886	890	899	903
Average number of bedrooms (as per certificate)	4.4	4.5	4.4	4.3
Average occupancy				
1. As per BASIX occupancy/bedroom no	3.6	3.6	3.6	3.7
2. Survey results	3.8	3.8	3.8	n/a ^(a)
Proportion with dual reticulation	13%	11%	12%	9%
Year of BASIX certificate				
2004-2005	54%	41%	23%	13%
2005-2006	45%	52%	31%	25%
2006-2007 or 2007-2008	1%	7%	45%	53%
2008-09	-	-	1%	9%
2009-10	-	-	-	1% ^(b)

(a): Not reported as a large proportion of the 2010-11 sample was not surveyed but identified through completion receipt dates.

(b): Total adds to more than 100% due to rounding

Water consumption analysis

To determine if BASIX is achieving its objective, the actual potable water consumption of each dwelling included in the sample is compared with the target consumption for that dwelling, ie the BASIX Benchmark consumption for that dwelling minus the BASIX Target saving of 40%. The actual percentage savings for each property are calculated as follows:

$$\% \text{ savings} = \frac{\text{benchmark consumption} - \text{actual consumption}}{\text{benchmark consumption}}$$

Savings are also calculated by the year when the BASIX certificate was generated.

Performance of BASIX dwellings

The sample properties are performing close to the target of a 40% reduction relative to the BASIX Benchmark. Over the past four financial years 2007-2008 to 2010-11 the average savings were 40.6%, 37.6%, 35.8% and 36.3% respectively – see Table 2. The downward trend between 2007-08 and 2009-10 has not continued and 2010-11 savings are slightly higher than 2009-10. It appears savings are stabilising at about 36%.

Table 2 Consumption and savings

Results	2007-2008	2008-2009	2009-10	2010-11
Analysable sample (number of dwellings)	837	1,392	2,479	5,294
Average BASIX benchmark consumption (kilolitres)	324	325	328	330
Average target potable water consumption (ie BASIX benchmark – 40%; kilolitres)	195	195	197	198
Average actual potable water consumption (kilolitres)	192	201	209	208
Average percentage savings relative to BASIX benchmark	40.6%	37.6%	35.8%	36.3%
95% confidence intervals	38.4–42.9%	35.6–39.5%	34.3-37.3%	35.2-37.4%
5% trimmed mean savings	43.4%	40.8%	39.1%	40.5%
Median savings	48.0%	45.1%	43.7%	45.0%
Percentage that achieves savings of 40% or more	61%	57%	56%	57%
Percentage whose consumption exceeds their benchmark consumption	10%	13%	13%	12%

Figure 1 shows the distribution of the percentage savings. Fifty-seven percent of the sample met the target savings, ie achieved savings of 40% or more.

A negative number indicates that actual consumption was higher than the benchmark consumption. For example, a percentage saving of -100% means actual consumption was twice as high as the benchmark consumption, -200% that it was three times as high, etc. The percentage of properties whose consumption was higher than the BASIX benchmark was 12%.

From Figure 1 it is clear that there were a number of “outliers”, ie properties with extremely low savings. For example, although hard to discern in Figure 1, there was one property with a “saving” of -413%, ie it consumed more than 5 times its benchmark consumption.

Such outliers are likely to reflect one-off circumstances. The 5% trimmed mean excludes the 2.5% highest and 2.5% lowest values and is therefore less sensitive to outliers. The 5% trimmed mean for 2010-11 is 40.5%. It has been greater than 40% every year except for 2009-10. The median savings, another measure that is less sensitive to outliers, were 45%.

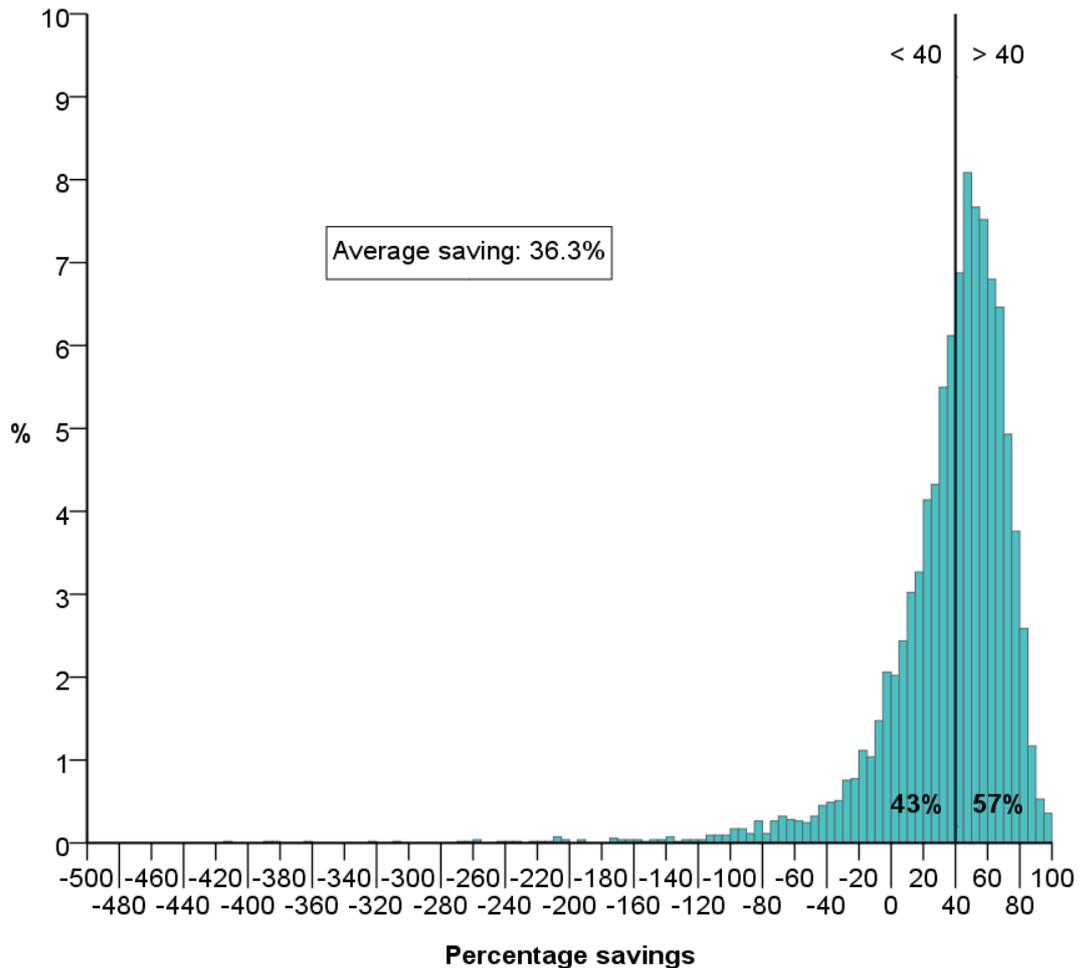


Figure 1 Distribution of percentage savings in 2010-11

Previous results (Sydney Water, 2011) appeared to show a downward trend in savings. This trend has not continued and savings appear to be stabilising at about 36%. The apparent downward trend is likely to have reflected one-off factors rather than a systematic downward trend in the savings from the BASIX policy.

The year 2007-08 was characterised by a very wet summer which is likely to have resulted in above average savings. The great majority of BASIX properties, about nine out of ten, have a rainwater tank. In wet years, tank yields will be relatively high while demand for outdoor watering will be relatively low. This would have resulted in relatively low demand and therefore relatively high savings against the BASIX benchmark, see Sydney Water (2008). Second, drought related water restrictions were lifted in June 2009. This may have resulted in a slight increase in demand and therefore lower savings in 2009-10.

The combination of above average savings at the start of the monitoring period together with an increase in demand in 2009-10 due to the lifting of drought restrictions resulted in an apparent downward trend in savings.

As in previous years, certificates generated from July 2005 performed significantly better than certificates generated before that date – see Table 3. Average savings by the former were about 38% compared to about 26% for the latter.

Table 3 Savings by year BASIX certificate was generated

	2004-2005 BASIX Certificates	Post July 2005 BASIX Certificates
2010-2011 savings	26.4%	37.6%
2009-2010 savings	28.5%	38.2%
2008-2009 savings	32.7%	40.9%
2007-2008 savings	36.7%	45.1%

Substantial improvements to the BASIX tool were implemented in 2005-2006. Improvements to the BASIX tool as well as advancements in the integration of water saving technology into new dwelling design may explain the higher savings by dwellings with certificates issued after July 2005. If so, the water savings for certificates generated after July 2005 are likely to be more representative of the long-term performance of BASIX.

Conclusions

The BASIX policy is one of the NSW Government's key initiatives in promoting a water and energy efficient future for NSW. To ensure that BASIX is implemented as intended and to its full potential, Sydney Water and Department of Planning and Infrastructure are undertaking an in-depth monitoring study. Results show BASIX dwellings are performing close to the predicted 40% reduction target.

Over the past four financial years from 2007-2008 to 2010-11 the sample of BASIX dwellings have saved 40.6%, 37.6%, 35.8% and 36.3%, respectively. The apparent downward trend in savings previously observed is likely to have been due to one-off factors and savings appear to have stabilised at about 36%. The 5% trimmed mean, which removes outlying observations, was 40.5%.

Certificates generated after July 2005 perform significantly better than certificates generated before that date with average savings of about 38%. This is likely to reflect improvements to the BASIX tool at that time. As such, the average savings of 38% for this group are likely to provide a more appropriate measure of the long term savings from the BASIX policy.

Overall, these results shows that BASIX dwellings are performing very close to or at the 40% reduction target. BASIX water savings will continue to be monitored and reported on an annual basis to confirm the long-term policy achievements.

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