Wessex Water
Water Efficiency Trial
March 2009

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1. EXECUTIVE SUMMARY

This report outlines a water efficiency trial that Wessex Water undertook in conjunction with Somer Community Housing Trust, the Environment Agency and Resource Futures in 2008/09. The trial involved assessing the uptake, effectiveness and costs of different water efficiency activities in 24 blocks of social housing flats in Bath.

The blocks of flats were split into four groups comprising four or five blocks:
Group 1: Devices only – water saving devices installed free of charge
Group 2: Devices and engagement – both education and devices were offered to the flats
Group 3: Engagement only – visits made with educational information
Group 4: Control – no visits made to the blocks.

Water use in each block was monitored before and after the interventions using meters and data loggers programmed to record flow at 5-minute intervals.

Uptake rates for the interventions were high. 45% of the flats targeted for device interventions had Ecobeta dual flush devices retrofitted and 50% of householders in the flats targeted for engagement activities participated in discussions about water efficiency in their home. These uptake rates are higher than have been found in other studies and it is thought that this is because householders in social housing are used to tradesmen visiting their homes and so were particularly amenable to the interventions. The uptake for a *Water Saving Day* in a village hall which was organised as part of the educational interventions was, however, very low (two attendees from 156 invitations to the event). This further suggests that the residents were most receptive to water efficiency messages if they are presented to them and require minimal effort to receive.

Data analysis of average water consumption shows that 11 out of the 13 blocks where interventions took place used less water following the interventions. Changes in water use in these blocks ranged from -14% to +4%. In contrast, only three out of eight blocks in the control group exhibited reductions in water use over the same period and overall changes varied between -14% and + 12 %. These finding suggest the interventions were effective in reducing demand.

The device interventions appear to be more consistently effective than educational engagement. Four of the five blocks fitted with Ecobetas showed a reduction in water use which averaged 6.3%. The four blocks which received only the educational engagement visits also show a reduction in consumption however the savings are generally less. Three of the four saw changes of -2.4% to -5.2% although the fourth block recorded a change of -13.9% which appears to be an outlier in the dataset.

The cost benefit analysis, although not conclusive owing to variability in some of the results, indicates device installation alone cost £0.81 per litre saved per day, engagement alone cost £0.78 - £1.62 litre saved/day and devices and engagement together cost £2.03 litre saved/day.

The largest cost component for each of the interventions was staff time either for plumbers to install the devices or social marketing specialists to engage in educational activities with householders. These costs could be reduced by carrying out multiple interventions in a single visit, or by arranging for Housing Associations to carry out installations at the same time as their routine maintenance visits.

2. INTRODUCTION

2.1 Background information

Water efficiency measures can play an important role in maintaining the balance between supply and demand of water resources to help ensure we operate a sustainable business. Furthermore, regulatory legislation[1] to promote water efficiency and government aspirations to reduce per capita consumption mean that understanding the effectiveness (and cost) of various measures is becoming increasingly important.

Wessex Water has undertaken a water efficiency trial in order to:

- gain more understanding of the effectiveness of different approaches to encourage water efficiency
- increase existing knowledge on the uptake of water efficiency activities and
- assess the savings attributed to different activities.

Various water efficiency trials have been carried out by other water companies, however very few have worked with Housing Associations. This trial was therefore set up to explore the benefits of working in conjunction with Housing Associations, and with a different target population.

Somer Community Housing Trust (SCHT) had previously expressed an interest in working with Wessex Water on environmental and sustainability projects and this prior communication helped to develop the partnership for this water efficiency trial.

The project was then identified and selected by the Environment Agency as a suitable project for research into the effectiveness of education and information in reducing demand levels. Resource Futures, a waste consultancy with expertise in communication methods, were contracted to run the social engagement aspect of the project and were also involved in the design of the trial. Resource Futures were also contracted to run the Natural England Living Rivers trial in the Salisbury area, which is a separate study to this.

2.2 Aim and objectives

The project was set up to assess the effectiveness of different approaches (termed interventions in this report) in reducing water consumption in social housing flats. Outcomes of the trial will be used to enhance the existing evidence of water efficiency initiatives and to help determine the costs and benefits of future activities.

The objectives of this project were to:

- determine the uptake of different interventions
- quantify savings from different interventions
- calculate the cost benefit of the interventions
- assess the viability of similar wider scale programmes.

[1] Ofwat have recently set water companies the target of reducing consumption by one litre/property/day from 2010 to 2015 to help achieve the Government's aspirations of reducing average per capita consumption from 150l/p/d to 130l/p/d by 2030.

3. TRIAL LOCATION

Following discussions with SCHT, it was decided that a suitable location for the trial would be the Twerton Estate on the western side of Bath. 19 blocks of flats were used in Twerton, and a further five blocks were available in the Moorfields area (2 miles east of Twerton). The locations of the blocks are shown in Figure 1 below.

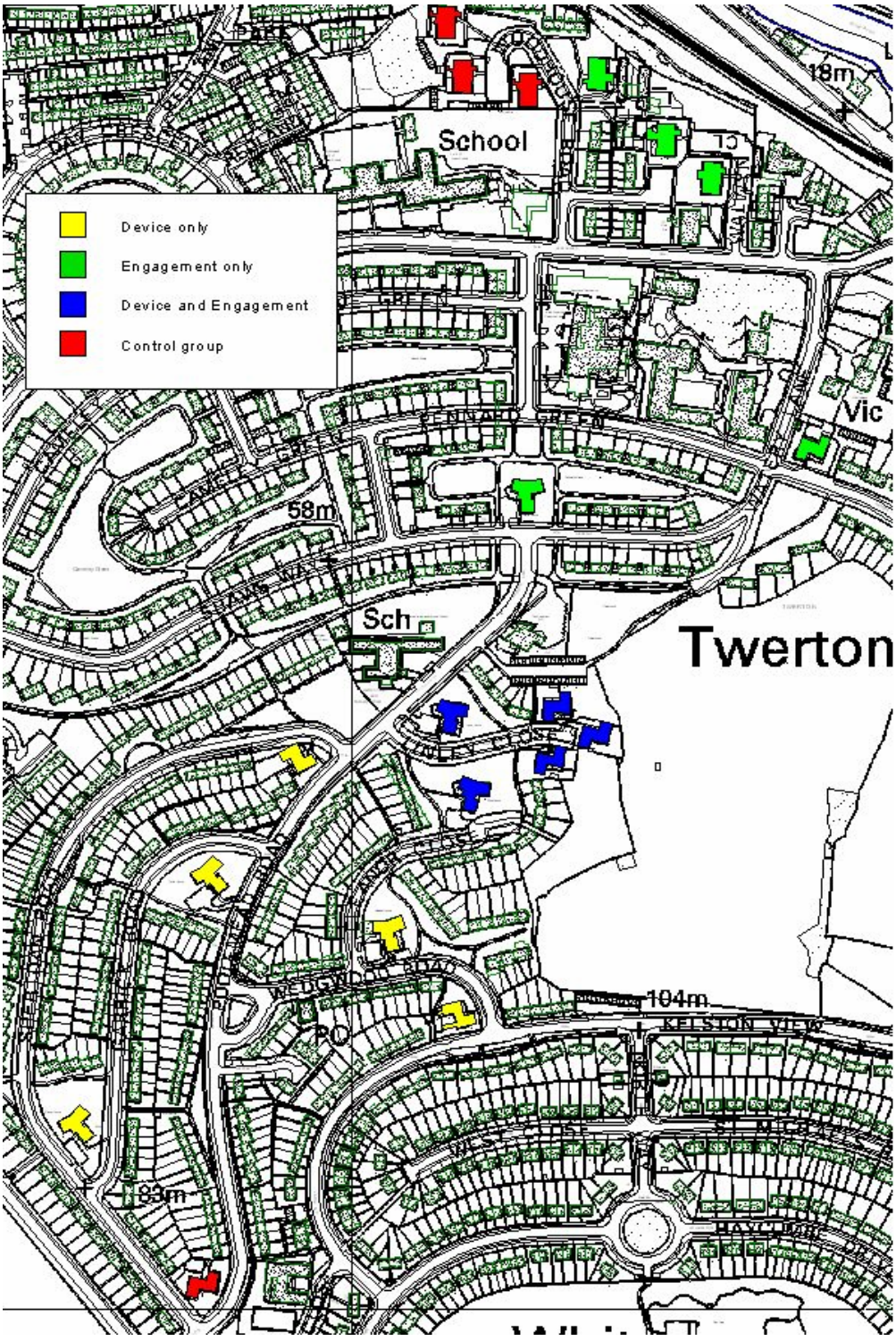


Figure 1: Location of the blocks of flats within the Twerton area

4. PROJECT APPROACH

4.1 Overview

The trial approach agreed by Resource Futures and Wessex Water was to investigate the effectiveness of the installation of water saving devices compared to educational engagement with residents in influencing their behaviour.

This was achieved by:

- assessing current water usage
- carrying out an intervention
- monitoring the change in water use.

Three groups of interventions and two control groups were applied (shown in Figure 1):

Group 1: Devices only (D)
Group 2: Devices and engagement (DE)
Group 3: Engagement only (E)
Group 4: Control Twerton (CT)
Group 5: Control Moorfields (CM)

The blocks of flats were split into geographical groups, shown in Figure 1. The blocks were divided in this way in an attempt to keep the interventions independent of each other. However, Twerton estate residents are considered to be a fairly tight-knit community so diffusion of information can not be disregarded. The five blocks in the Moorfields area were also used as a separate control group to supplement the control data collected from Twerton.

The activities undertaken in each stage of the study are shown in Figure 2 below.

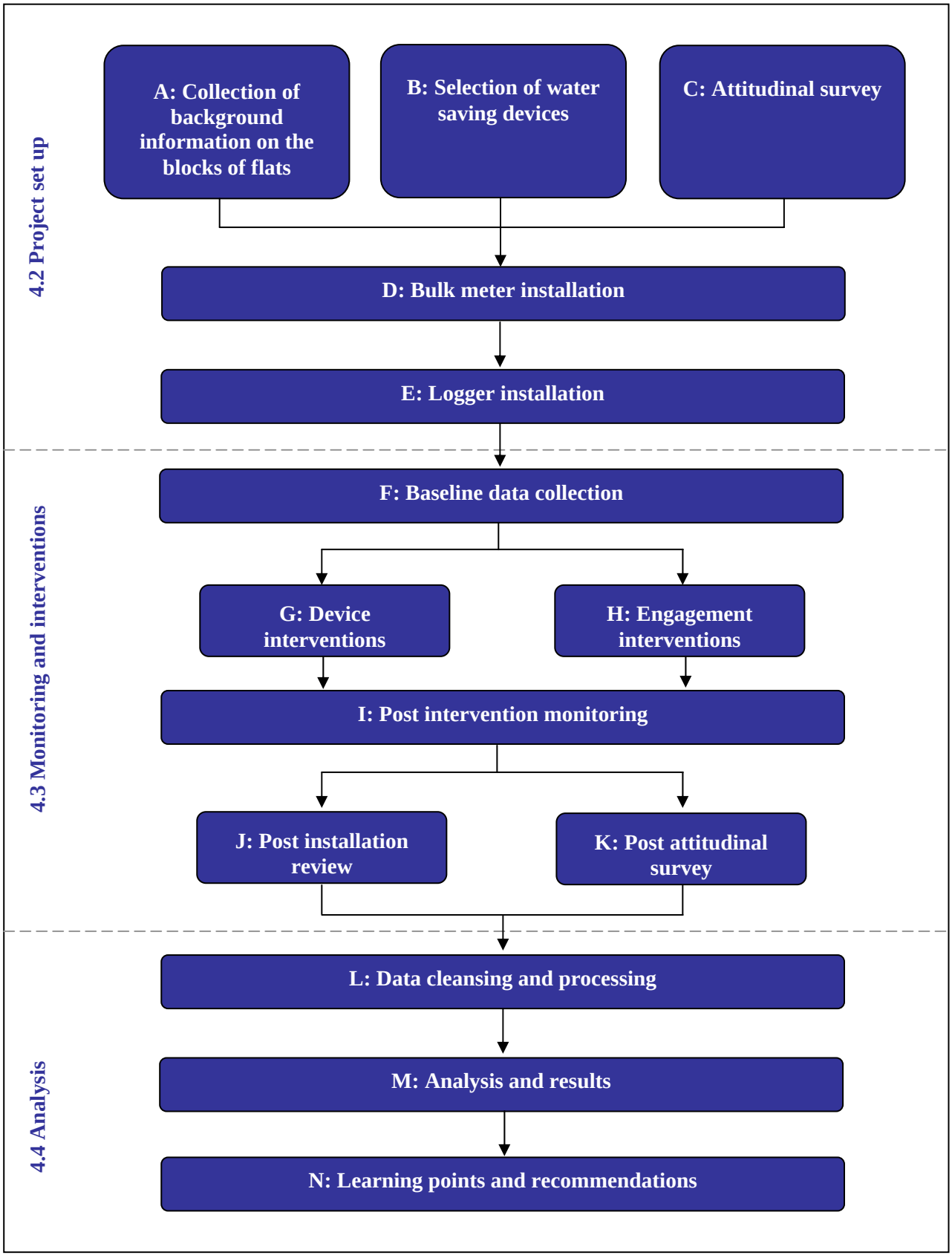


Figure 2: Trial approach

4.2 Project set up

A. Collection of background information on the blocks of flats

For each block of flats in the trial SCHT provided relevant information on:

- the number of flats in the block
- the sizes and occupancy rates of the flats
- the demographics and management concerns of the blocks
- the number of occupier owned flats and
- the number of flats with a meter.

The blocks of flats are comparable in design. They each have between 10 and 18 flats made up of studios, one-bed and two-bed flats. The number of residents in each block varies between 11 and 38. Ninety percent of flats are social housing properties, managed by Somer Community Housing Trust and 10% are owned by their occupiers as leaseholders. A summary of the details of all the blocks is given in Appendix 1.

B. Selection of water saving devices

The aim was originally to install a range of water efficient devices to gauge the savings that can be made from a 'basket' of measures. Visits were made to some of the flats with a SCHT tradesman to confirm which measures were appropriate for the flats.

Table 1: Suitability of different measures

Device	Assessment of suitability	Included in trial?
Low flow shower head	Only a small number of the flats have showers, and these are electric showers, which are not suitable for low flow shower heads.	No
Aerating tap inserts	The taps in the flats are all different styles and sizes and some have oval outlets. A variety of tap inserts were trialled but none were found to be suitable.	No
Dual flush retrofit	The toilets are mainly nine-litre cisterns and therefore suitable for dual flush retrofit devices.	Yes
Save a flush	The toilets are suitable for *Save A Flush* devices.	Yes
Washers to fix leaking taps	Some taps were suitable for washer replacements, others may need complete replacement.	Yes

Although on their visits the plumbers may have found taps suitable for the tap inserts, it was expected to only be in very few cases and it was decided that more could be read into the results if dual-flush retrofit devices along with save a flushes were the only devices used.

Following advice from Waterwise it was agreed that the Ecobeta dual-flush device would be used. The use of these in other trials has shown they are quick and straightforward to install.

C. Attitudinal survey

Resource Futures conducted a survey on attitudes to water use in homes and existing behavioural patterns of the residents in May 2008 before the interventions were carried out. All flats in all of the blocks were targeted, including the control blocks. A letter was sent out prior to the visits to make people aware of the visit and to encourage participation. The survey questions are given in Appendix 2.

D: Bulk meter installation

Between December 2007 and March 2008 bulk meters were installed on the supply pipes to all the blocks by a Wessex Water contractor, Water Support Services. This approach rather than monitoring individual flats was considered the easiest and most cost effective way of collecting data.

Prior to any works commencing, a notice was put up in all the blocks explaining that Wessex Water would be working on the supply pipes. This was to keep the residents informed and to try to dispel any interest in the works. A copy of the notice is included in Appendix 4. The contractors faced several difficulties in installing the meters, due to the lack of detailed mapping of the location of the supply pipes and knowledge of how many supply pipes fed each block. This resulted in several investigatory excavations taking place around some of the blocks, provoking some concerns from residents and SCHT.

Meters were successfully installed on 19 blocks in the Twerton area and five on Moorfield Road. The majority of the blocks had two bulk meters and a few had one bulk meter, further details on this and the dates of installation are given in Appendix 4.

E: Logger installation

Technolog data loggers were fitted to the meters by Mouchel technicians in order to record the water use patterns of the blocks of flats. Sourcing the correct probes for the loggers proved difficult, and this resulted in a delay in connecting some of the loggers to meters. The delay was quite extensive in some cases; the start dates of the logging on the blocks range from April to September 2008 (details are given in Appendix 4). This compromises the baseline logging period for some of the blocks.

The raw data volumes used were recorded in litres per second (l/s), at 5 minute intervals.

The technicians were unable to fit loggers on to two of the blocks: E1 and CM4. There are therefore no results for these blocks in this report. Given the low volumes recorded for DE2 and CT4, it is believed that only half of the consumption of those blocks is being metered.

4.3 Monitoring and interventions

F: Baseline data collection

The logger data was downloaded and calibrated weekly until the team were confident the loggers were recording accurately. Subsequently data was downloaded monthly by Mouchel technicians and meter reads were taken at the same time as a validity check and as a back up. Data was downloaded into PMAC, which is data logging and control software. The software enabled data to be viewed and analysed.

G: Device interventions

Contract plumbers were hired through SCHT to install the devices. They were existing contractors of SCHT and familiar with the properties. A training session was held to give them an overview of the project and details of their role, and to provide training in Ecobeta installation.

The installation of devices took place in October 2008. It was agreed the plumbers would make up to three visits to each flat to install the devices.

The plumbers were asked to inform the residents they were fitting devices for SCHT to save water. Where the residents consented to this, the plumbers were advised to fit an Ecobeta where suitable and a *Save a Flush* cistern displacement device where not. Where dripping taps were found, the plumbers were instructed to replace washers where possible.

The plumbers were paid on a daily rate for six days' work. It was agreed a daily rate was the best way to pay, as the uptake rate was unknown and it was essential that the devices were installed correctly to ensure good performance and customer satisfaction. The plumbers kept records detailing which properties had been visited and whether any taps had been fixed and any Ecobetas fitted, and any comments made by the resident.

H: Engagement interventions

The engagement interventions were led by Resource Futures. A wide range of activities for water efficiency promotion were appraised including pub quizzes, a tour of a water treatment works, children's education days and a travelling information centre.

The final assortment of engagement activities were selected on the basis that

- SCHT felt that residents would be receptive to them
- they could be realistically be done by water companies in the future.

Canvassing

Following discussions with SCHT, it was decided to take a door to door approach to speak to residents as it was felt that the target population would be more receptive if the message was taken to them.

A team was selected through Resource Futures to carry out canvassing of the blocks. The team was led by a Resource Futures employee and received training prior to making the visits.

The canvassing was carried out at the beginning of October 2008. An approach similar to that of the plumbers was used- with each flat targeted with education interventions being visited up to three times. The canvassers tried to engage the residents in conversation, gave them information and facts and had some *"giveaways"* to hand out. The *"giveaways"*, designed by Resource Futures, were to act as reminders in the kitchen and bathroom and all had water saving messages on them. These included shower timers, magnets and *Save a Flush* devices.

The canvassers also handed out pledge cards with actions for people to meet, with an incentive of winning an eco kettle. A copy of the pledge card is given in Appendix 5.

The canvassers were asked to leave a pledge card, a flyer for the Water Saving Day and a '*Water saving in your home'* leaflet when residents had not been in when any of the visits had been made.

Records were kept of which properties had been visited and which *"giveaways"* had been handed out to the different flats.

Water saving day

A water saving day was promoted to all households in the social engagement blocks by word of mouth, flyers and posters (see Appendix 6). It was held on the afternoon of Thursday 30 October at Twerton village hall half a mile from the trial blocks. The hall was set up with information areas, a water use calculator, information on getting a meter, a face painter, a Wessex Water education adviser and giveaways including tea towels, washing up bowls, watering cans, and information booklets.

I: Post intervention monitoring

Water use monitoring continued for three months following the interventions. Consumption volumes were checked against the respective meter reads on a monthly basis to ensure accuracy. Any problems identified were passed out to the technicians to resolve.

J: Post installation review of the Ecobeta device

In February 2009 a return visit was made to the flats where the Ecobetas were installed. The plumbers questioned the residents on whether the devices were still installed and whether they used the short flush. Any other comments made by the residents were noted.

K: Post intervention attitudinal survey

The post-intervention survey was carried out by mail in February 2009. This was a shorter survey than the original one and residents were asked to post back their answers to Resource Futures. A copy of this survey is provided in Appendix 7.

4.4 Analysis

L: Data cleansing and processing

Water use data was downloaded from the loggers every month, and the total volumes were checked against the meter reads to ensure the loggers were recording correctly.

Although the logging equipment was new, a few issues were experienced with the logger data. Some issues were due to the functioning of the loggers and others for different reasons. To ensure that these issues did not affect the data, it was validated. Table 2 outlines the issues that arose, how these were solved and whether the data was included or excluded from the analysis.

Table 2: Issues experienced with the data and their solutions

	Issue	Data validation and inclusion/exclusion
Logger issues	Some of the loggers were set up reading only proportions (50%/20%) of the volume which passed through the meter.	This was noted when checks were made against the meter reads and volumes were amended and included in analysis
	There were periods when the loggers stopped working- pulse leads or logger technician errors – this is the most common issue.	Sometimes only one of the two loggers did this however the data during this period was excluded from analysis.
	There was a period when the volumes recorded by one of the loggers (D4) was slowly decreasing compared to the meter reads.	The reason for this was not identified, but the pulse lead was replaced and data for the period excluded.
Other issues	On two occasions pulse leads were vandalised so no data was collected until the problem was spotted at the time of the subsequent meter read.	Pulse leads were replaced. There was no data to include in the analysis.
	There were periods of obvious leaks when the five minute data didn't record 0l/s for long periods of time e.g. CT1, CM3 and CM5.	The data was corrected by calculating how much was lost due to the leak using the minimum consumed volume and the number of days this occurred.
	Periods of unexplained unrealistically high or low use.	Excluded from analysis.

An example of a graph produced in the PMAC software is given in Appendix 8. This demonstrates how the leaks were spotted and equivalent volumes were subtracted from the dataset.

M: Analysis and results

Due to the small data set statistical tests could not be carried out on the data collected. Comparative analysis was therefore carried out instead.

Change in consumption:
In order to calculate if any change in consumption resulted from the trial interventions the average daily consumption for the time period following the interventions was compared to the average daily consumption prior to any interventions. Total daily volumes were calculated in PMAC from the five-minute data collected. These volumes were then averaged for the two comparison periods.

For subsequent analysis this data was normalised to eliminate external influences by using the change observed in the control blocks.

The periods considered for the period 'before' and 'after' are detailed in Table 3 below. The exact periods of time used for the individual blocks vary depending on when the loggers were installed and reading correctly. Dates used for the start of the monitoring period for each individual block are detailed in Appendix 4.

Table 3: 'Before' and 'after' monitoring periods used for analysis

Intervention group	Before	After
Device only	Start to 12/10/08	24/10/08 to 21/01/09
Device and engagement	Start to 30/09/08	24/10/08 to 21/01/09
Engagement only	Start to 30/09/08	7/10/08 to 21/01/09
Control Twerton	Start to 30/09/08	24/10/08 to 21/01/09
Control Moorfield	Start to 30/09/08	24/10/08 to 21/01/09

Per person consumption
Per person consumption was calculated by dividing the total consumption for the block by the total number of people in the block (using occupancy data provided by SCHT). Per capita consumption was also worked out for the post intervention period, although these figures will represent the savings made spread over the whole block, and not just in the flats with the interventions.

Savings per visit
The savings made per visit were calculated by dividing the average daily savings for the whole block by the number of successful visits made to the block. Figures for the 'device and engagement' group were worked out based on the number of flats receiving at least one intervention.

Cost benefits:
The cost benefit for each of the interventions carried out was calculated by dividing the total litres saved for each group by the cost of that set of interventions. The proportion of time spent on the installations in the specific group determined the proportion of the total staffing cost for that activity. In this analysis the assumption was made that 100% of the savings observed were attributed to the interventions carried out.

5. PROJECT RESULTS

This section presents results on the uptake of interventions (Section 5.1), reviews changes in consumption before and after the interventions and considers the savings made from each visit (Section 5.2). A cost benefit analysis of each intervention group is carried out in Section 5.3.

5.1 Intervention uptake

5.1.2 Householder uptake of devices

Table 4 below shows the number of Ecobetas installed in each of the blocks and other maintenance work carried out.

Table 4: Details of the interventions carried out in the blocks with the devices

Intervention group	Block	No flats	No Ecobetas installed	No refused entries	% flats fitted with Ecobeta	Save A flush fitted	Other work done
Devices	D1	18	10	1	56	0	Replaced 1 lever tap
	D2	16	8	0	50	0	3 new siphons
	D3	18	9	0	50	0	Replaced one lever tap
	D4	10	2	2	20	0	New siphon
	D5	16	8	0	50	0	2 lever taps replaced unblocked wc pan
	TOTAL	**78**	**37**	**3**	**47%**		
Device and engagement	DE1	18	6	1	50	0	
	DE2	10	3	1	33	0	
	DE3	16	6	2	38	0	
	DE4	16	7	0	44	0	
	DE5	18	11	0	61	0	Tap washer replaced
	TOTAL	**78**	**33**	**4**	**42%**		
ALL		**156**	**70**	**7**	**45%**		

Up to three attempts were made to visit each flat during the six days. The contract plumbers fitted Ecobetas in 70 flats out of the total of 156, which equates to 45% properties. Ecobetas were fitted in 47% of the device only flats and 42% of the device and engagement flats.

These are high uptake rates compared to those quoted in other trials. This could be explained by the fact that occupiers of SCHT properties are used to tradesmen entering their flats for repairs and maintenance checks. The number of devices installed may have been even higher if the plumbers had worked into the evening to catch a different section of the population, or if appointments had been made beforehand.

The devices were well received by most residents, and only seven people said they did not want the device. In 11 flats it was found that the toilet cisterns were inappropriate for the retrofit siphon, the majority of these were already dual flush toilets. All the others already had a *Save a Flush* fitted

apart from one which had a concealed cistern. Therefore no additional *Save a Flush* devices were installed.
In one instance the Ecobeta had to be removed immediately following installation as the ball valve movement was being impeded by the device, resulting in continuous release of water.

A few lever taps and siphons were replaced in the device only block and one washer was replaced on a leaking tap.

Post installation review
In February 2009 one of the plumbers made a return visit to the flats and spoke to residents of 54 of the 70 flats where devices were installed.

- All but three people were happy with the devices, with several commenting they are a really good idea.
- Two people had removed the devices themselves as they felt the pan was not clearing properly and the third device was removed by a SCHT tradesman when the siphon was replaced.
- All the residents reported that they use the short flush and only one resident commented that it was inconvenient to hold the handle down for a long flush.

5.1.3 Engagement visits

Attitudinal survey

The survey team targeted all the flats in the trial (372) and had an uptake rate of 73 respondents for the pre-intervention survey and 28 respondents for the post-intervention survey. The survey gave some interesting results, see table 5 below.

Table 5: Some results of the attitudinal survey carried out pre and post interventions

	Pre intervention	Post intervention
Agree or strongly agree that everyone needs to do what they can to reduce the waste of water	88%	93%
Think they do all they can already to save water	60%	Not asked
Always turn the tap off whilst brushing their teeth	62%	64%
Always turn the tap of when doing the dishes	87%	82%
Save water even if it requires additional effort	37%	36%
Save water if it requires no additional effort	45%	53%

The results of this survey show that the residents spoken to in the flats are/ say they are good with saving water. There is no great difference in the figures collected from the post-intervention survey to the pre-intervention survey, although the second surveys shows a slightly higher proportion of respondents believe everyone needs to do what they can to save water.

It is important to highlight the change in survey techniques for the pre-and post-intervention surveys. The people who made the effort to return the post-intervention surveys are probably more environmentally conscious than the ‘average’ person and this therefore may explain the slightly

higher results. Interpretation of attitudinal changes from these results must therefore be considered with caution.

Canvassing blocks

Table 6 below shows the number of flats which received the engagement intervention.

Table 6: Details of the number of blocks which received the engagement intervention.

	Block	No. flats	No. visits	No. refusals	% block visited
Device and	DE1	18	7	1	39
engagement	DE2	10	5	0	50
	DE3	16	8	1	50
	DE4	16	6	2	38
	DE5	18	9	4	50
	TOTAL	**78**	**35**	**8**	**45**
Engagement	E1	18	10	1	56
	E2	12	5	1	42
	E3	16	8	4	50
	E4	16	13	2	81
	E5	16	7	0	39
	TOTAL	**78**	**43**	**8**	**55**
		156	**78**	**16**	**50**

All flats were visited during the intervention period, and the canvassers engaged in conversation and gave out "*giveaways*" to residents of 78 of the flats, constituting 50% of all flats. 45% of the 'devices and engagement' group and 55% of the 'engagement only' group received the intervention.

Residents of an additional 16 flats declined to take part in the engagement activity.

Out of the 78 residents spoken to, nearly all of them appeared enthusiastic about saving water and were keen to have the *"giveaways"*. The table in Appendix 9 details the *"giveaways"* handed out to each block of flats. A total of 95 giveaways were handed out to residents in the 'device and engagement' block and 154 to the 'engagement only' block.

Residents of 64 of the flats agreed to make a pledge. Only two pledge cards were returned for the competition which, is a low return rate, although the pledge commitments may still have been achieved.

Where the householders were not in water saving leaflets and the Water Saving Day flyer were posted through their letterbox.

Water Saving Day

Despite high interest shown by the residents to the canvassers for the Water Saving Day, only two residents attended. The difference in uptake between this and the canvassing results is a valuable learning point; the social housing residents were more receptive when messages were taken to them.

This contrasts to the experience in Downton, Wiltshire where 200 village residents (adults and children) attended a similar event organised by Resource Futures for the Living Rivers Project. The difference in uptake may be attributable to the demographics of the social housing tenants in Bath, compared to Wiltshire village residents who are mostly employed owner occupiers. A key difference may also be that the Downton residents 'owned' the activity, whereas the Twerton residents were given it.

Of the two engagement activities, canvassing is more similar to what water companies would carry out in household audits, so it is beneficial to be able to attribute any savings made to just the canvassing activity.

Unfortunately some of the giveaways such as washing up bowls, tea towels and indoor watering cans were held back for giveaways for the water saving day. More materials could have been handed out in the blocks had it been known the water saving day was not going to be well attended.

5.1.4 Device and engagement visits

In the 'device and engagement' intervention group, 33 flats had an Ecobeta installed and 35 received education and information, however only 18 of the 78 flats received both the engagement and the device.

Table 7: Details of flats receiving both device and engagement

Block	No. flats	No. flats receiving device	No. flats receiving engagement	No. flats receiving both
DE1	18	6	7	**2**
DE2	10	3	5	**2**
DE3	16	6	8	**2**
DE4	16	7	6	**5**
DE5	18	11	9	**7**
Total	**78**	**33**	**35**	**18**

5.2 Consumption data analysis

Water use data was collected for 22 of the blocks.

5.2.1 Presentation of results

The results are summarised in Table 8 below and consumption profiles are presented in Figures 3 to 7. Gaps in the daily consumption data exist where no data was recorded by the loggers, and data that is excluded from analysis is represented by the light blue line. The reasons for the exclusion of some data points are explained in Table 2. The grey boxes highlight the periods during which interventions were carried out. Average daily consumption is calculated for the 'before' and 'after' intervention periods and is illustrated by the red and green lines, with the volume written in bold underneath the line.

Table 8: Average daily volumes before and after the intervention period

	Block	Average daily consumption before (l/block/d)	Average daily consumption after (l/block/d)	% change	Average daily consumption before (l/person/d)	Average daily consumption after (l/person/d)
Device	**D1**	4166.5	3622.4	-13.1	122.5	106.5
	D2	4786.7	4487.6	-6.3	129.4	121.3
	D3	4693.2	4285.6	-8.7	130.4	119.0
	D4	1743.1	1658.8	-4.8	116.2	110.6
	D5	3502.0	3499.75	-0.1	194.6	194.4
Device and	**DE1**	3304	3440.8	4.1	110.1	114.7
engagement	**DE2**	1225.0	902.0	-26.4	68.1	50.1
	DE3	2837.4	2637.1	-7.1	141.9	131.9
	DE4	3970.2	3512.5	-11.5	172.3	152.5
	DE5	4787.0	4481.0	-6.4	126.0	117.9
Engagement	**E2**	1568.5	1526.0	-2.7	142.6	138.7
	E3	3931.1	3715.7	-5.5	119.1	112.6
	E4	3603.8	3451.4	-4.2	124.3	119.0
	E5	4463.4	3831.8	-14.2	135.3	116.1
Control	**CT1**	4187.1	4283.1	2.3	123.2	126.0
Twerton	**CT2**	2967.6	3053.0	2.9	98.9	101.8
	CT3	3738.5	3588.0	-4.0	124.6	119.6
	CT4	1098.7	937.1	-14.7	54.9	46.9
Control	**CM1**	3985.5	4459.9	11.9	153.3	171.5
Moorfields	**CM2**	3455.5	3472.9	0.5	132.9	133.6
	CM3	7289.3	6415.0	-12.0	291.6	256.6
	CM5	4449.7	4915.7	10.5	148.3	163.9

The figures in grey for blocks DE2 and CT4 are where it is believed that only part of the total block consumption is being metered. The high value for per capita consumption for CM3 is due to a leak somewhere in the block. The litres/person/day figures are therefore incorrect for these blocks, however overall change in consumption can be included in the analysis.

The per capita consumption calculated varies considerably. This could be explained by variable occupancy rates. Occupancy data was provide by SCHT, however they were not very confident in the figures they provided us with, stating that there could be fewer or greater numbers in each flat.

Recent billing data was examined for metered flats in the trial area. This showed large variation in daily consumption for individual flats for the same time period in different years, indicating occupancy rates in the flats fluctuate considerably over time.

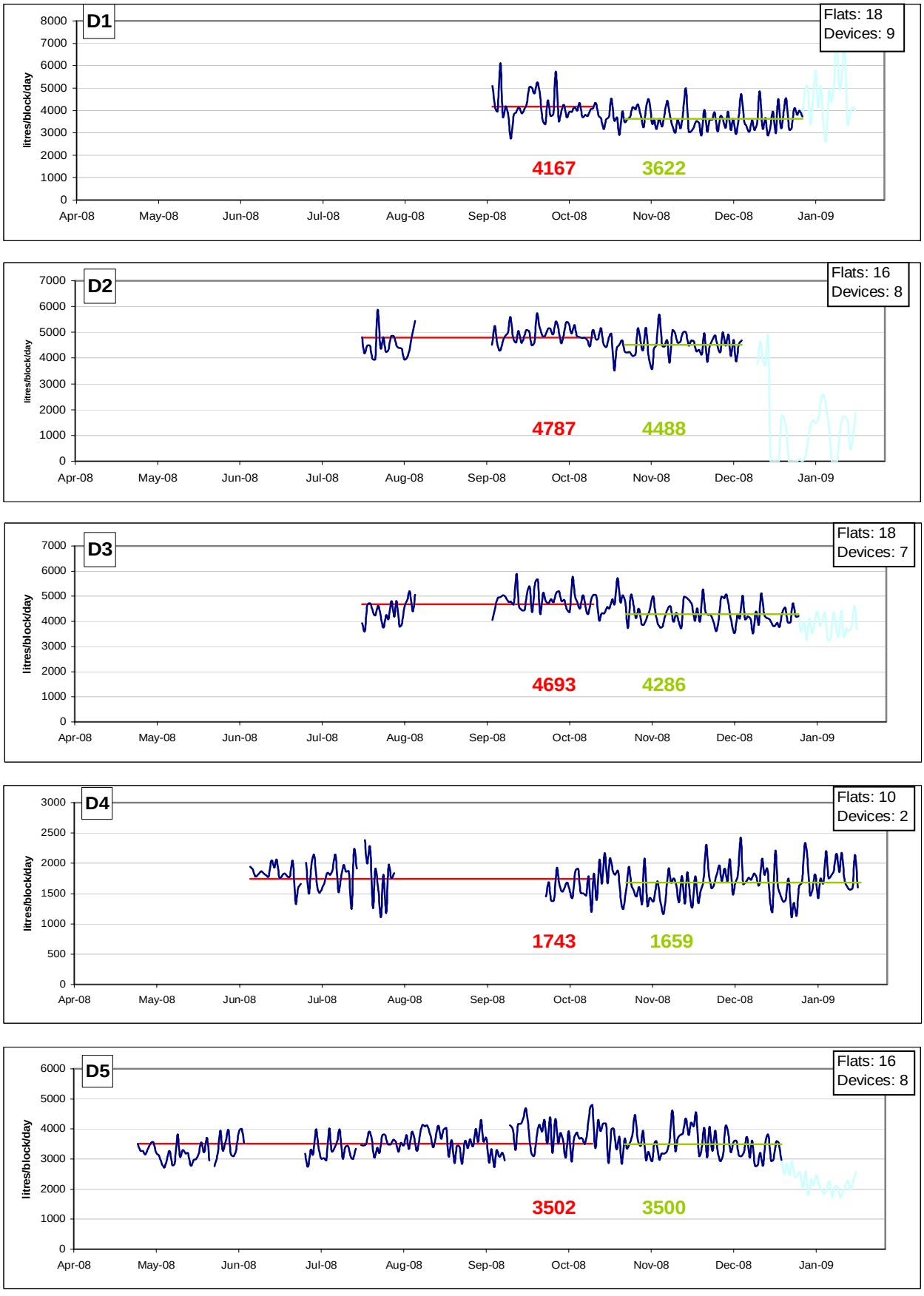


Figure 3: Daily consumption for the 'device only' blocks over the monitoring period and average daily consumption for the 'before' and 'after' periods.

The baseline (pre intervention) data is limited for the ‘device only’ blocks due to a four week period where loggers on four of the blocks were not recording.

All the ‘device only’ blocks showed a reduction in consumption following the installation of the Ecobetas. Block D5 showed only a very small reduction, despite half of the flats in the block being fitted with an Ecobeta. The other four blocks showed savings between 5% and 13%.

Block D5 showed the greatest initial consumption (194 l/p/d) and although 50% of the flats in this block were fitted with an Ecobeta, the data shows no subsequent reduction in water use. The raw logger data collected for one of the loggers shows numerous periods of a few hours or more where the consumption line does not drop to 0 l/s, which is unusual and different to the patterns observed in the other blocks. The figure calculated for per capita consumption is therefore higher than it should be, but the issue is prevalent throughout the monitoring period and so changes in consumption between ‘before’ and ‘after’ can be considered valid.

However, all blocks are within the 15% reduction evident for control block CT4.

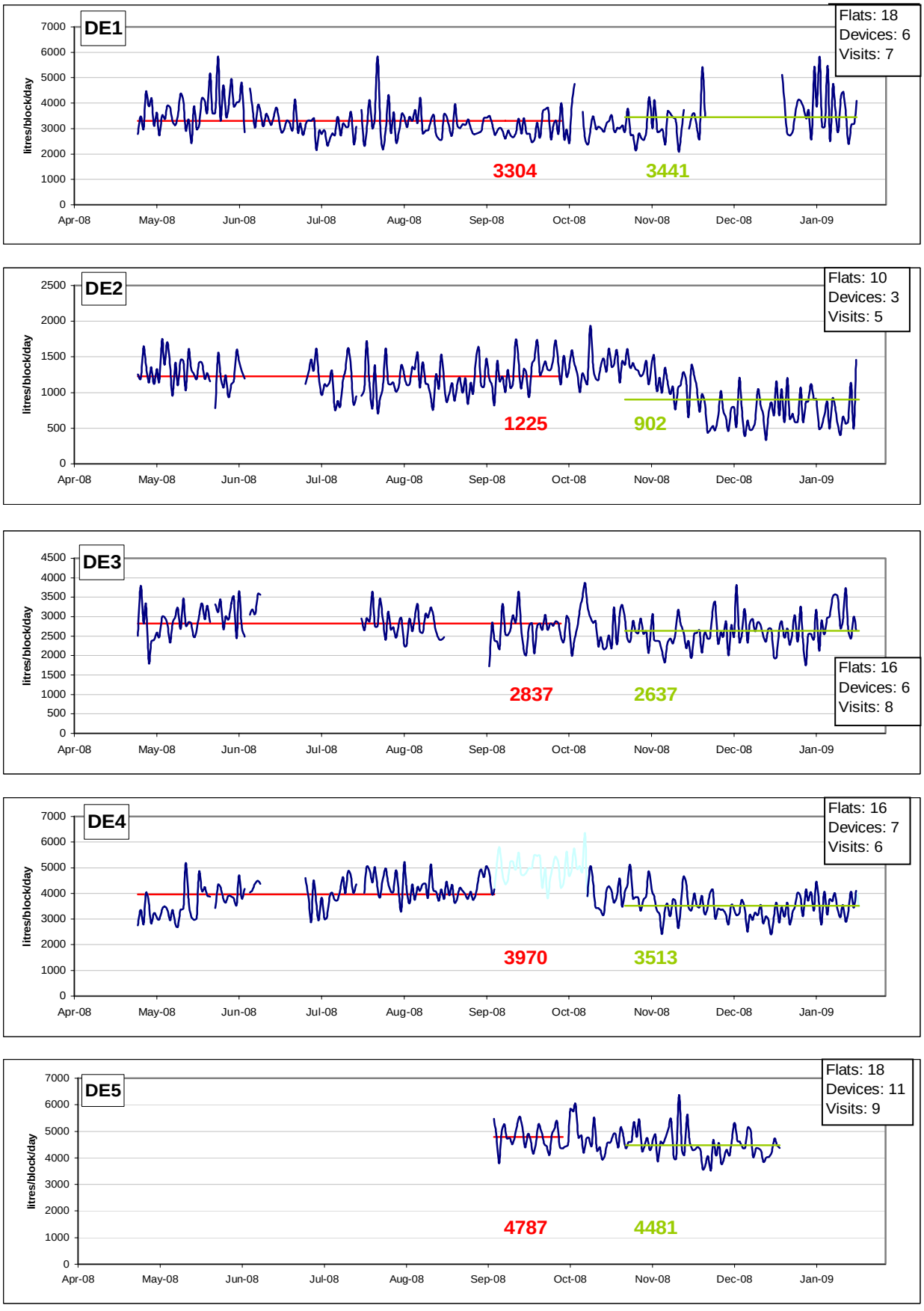


Figure 4: Daily consumption for the 'device and engagement' blocks over the monitoring period and average daily consumption for the 'before' and 'after' periods.

The consumption line for DE2 (Figure 4) shows a slow decline rather than a clear step down following the interventions. Given the nature of this decrease it is assumed to not result from the interventions and the block was therefore excluded from further analysis.

Three out of the four blocks considered for further analysis show a reduction in water used following the interventions. These three had reductions in water use of 6.4%, 7% and 11.5%.

Block DE1 shows an increase in consumption although it received 7 engagement visits and 6 out of 18 of the blocks had an Ecobeta installed.

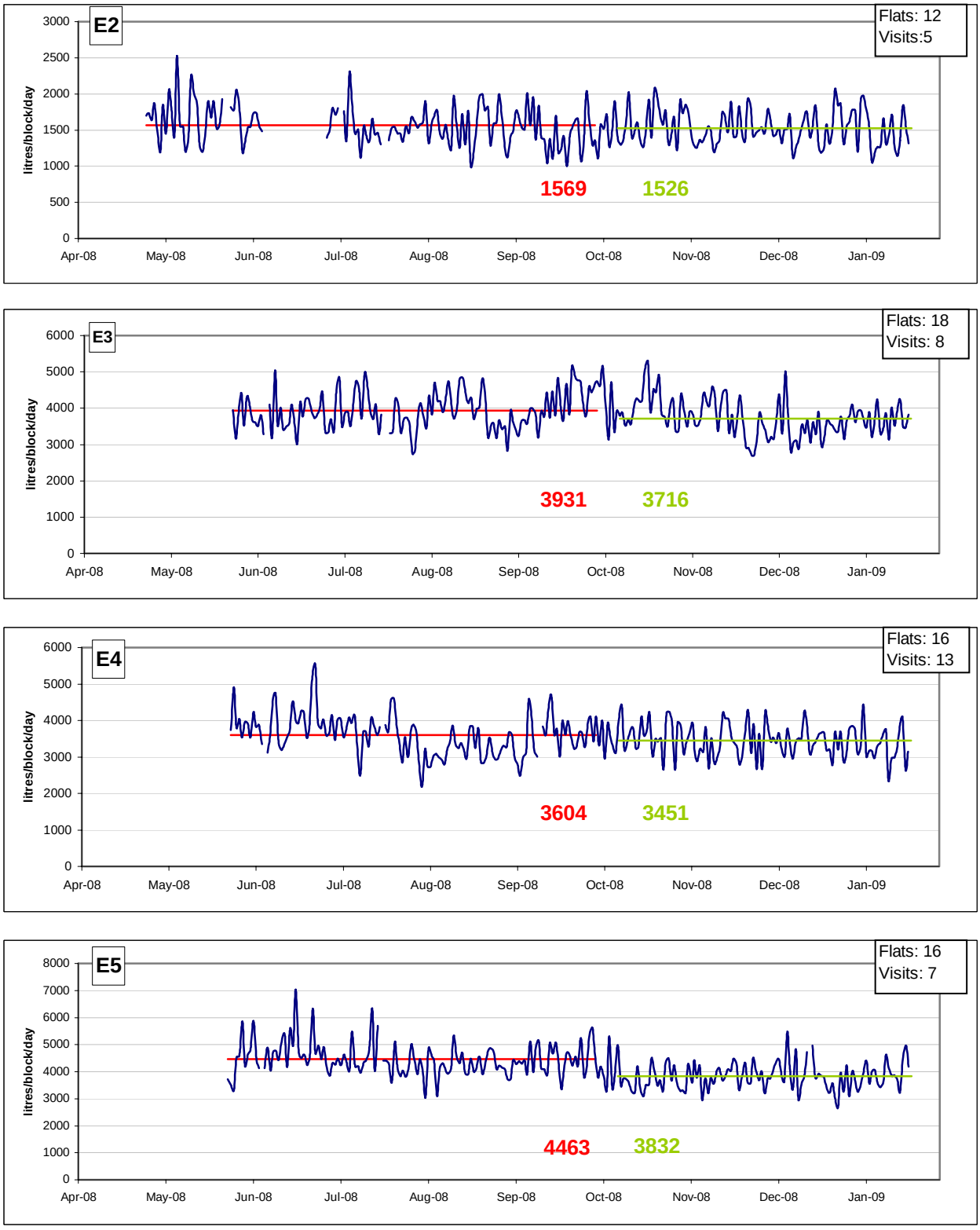


Figure 5: Daily consumption for the 'engagement only' blocks over the monitoring period and average daily consumption for the 'before' and 'after' periods

The monitoring period prior to the intervention is at least four months for all the blocks, which means the baseline data used for comparison is robust.

All the engagement blocks show a decrease in consumption following the canvassing visits. Three of the blocks show savings of between 2.7% to 5.5% and block E5 shows a saving of 14%, which is the highest out of all the intervention blocks.

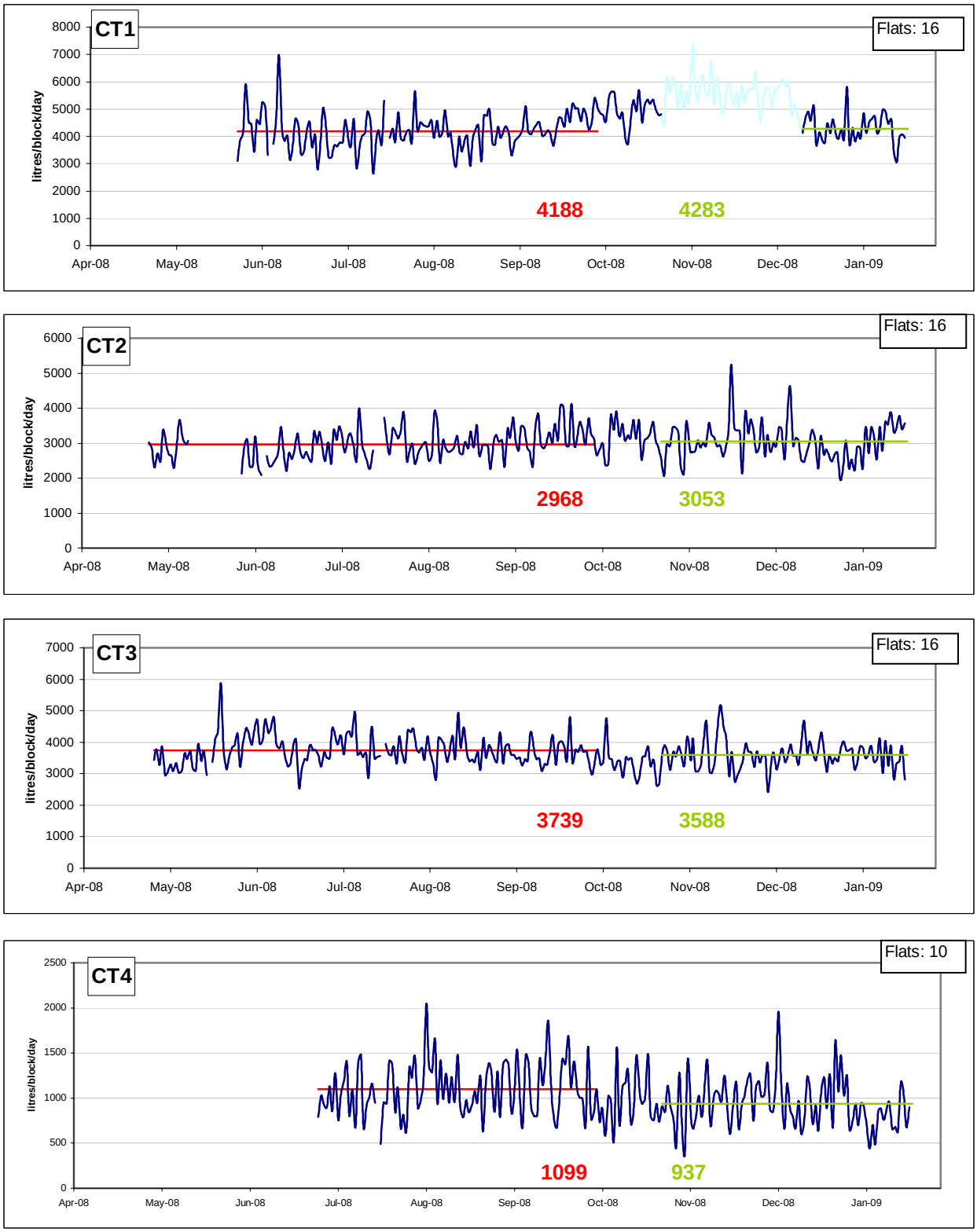


Figure 6: Daily consumption for the Twerton control blocks over the monitoring period and average daily consumption for the 'before' and 'after' periods.

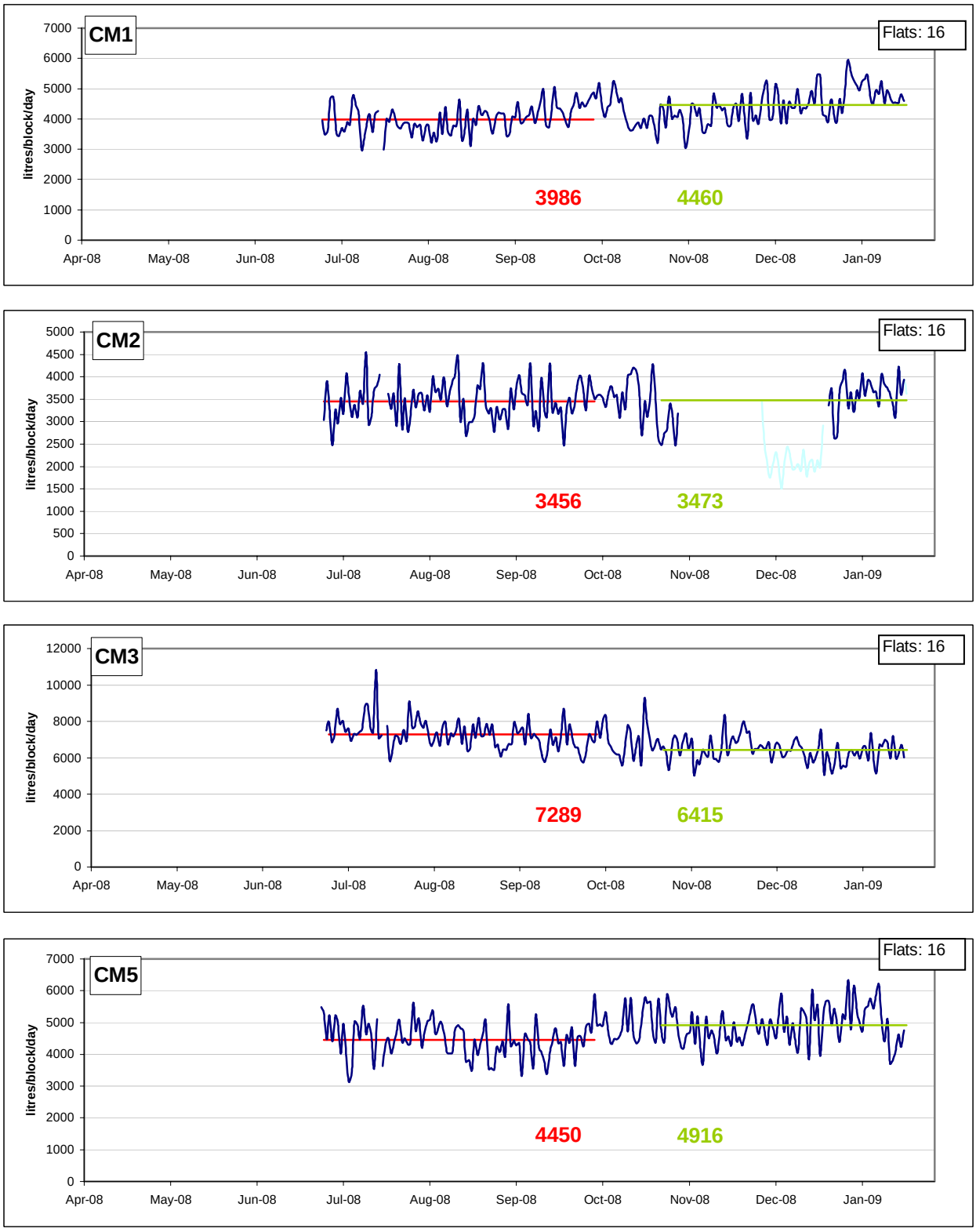


Figure 7: Daily consumption for the Moorfields control blocks over the monitoring period and average daily consumption for the 'before' and 'after' periods.

The control blocks all vary in terms of daily consumption and the changes in consumption experienced over the trial period. The Moorfield Road control blocks are similar in terms of the

number of flats and residents in each block yet the average daily volumes and the changes before and after the intervention period differ greatly. This highlights the variability in the data.

Out of the eight control blocks, three showed a reduction in water use from November to January and five showed an increase in water use.

The changes in consumption for all the blocks are summarised in Figure 8, and the average change for each group is shown in Figure 9.

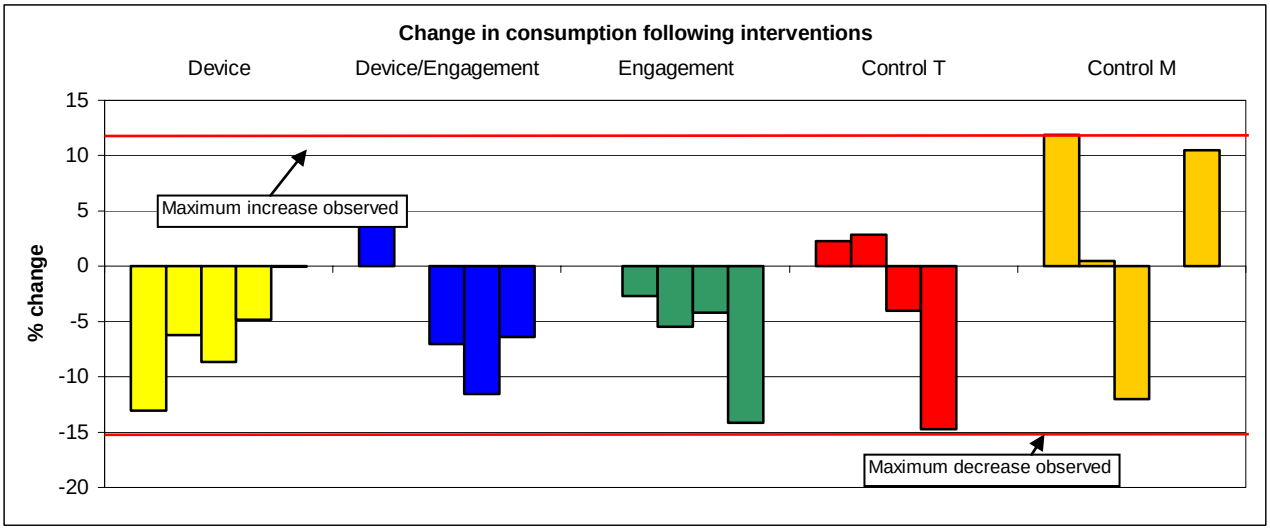


Figure 8: Percentage change in water use observed for each block following the interventions

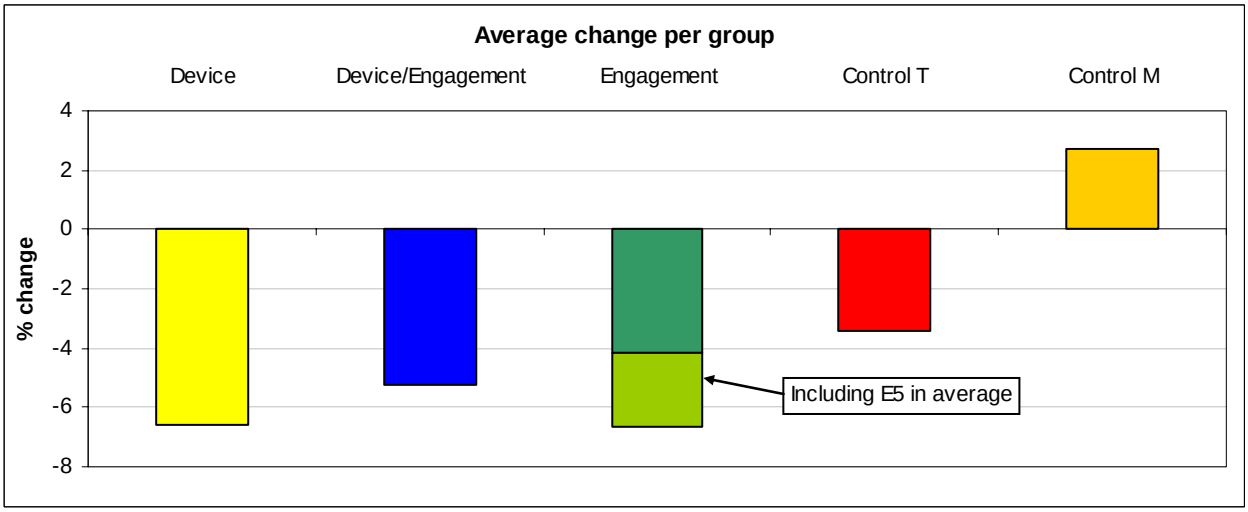


Figure 9: Average change in water use per group

The control data indicated that the consumption in the different housing blocks varies without interventions, yet 12 out of the 13 intervention blocks show a decrease in consumption. This indicates a correlation between interventions and reduced consumption.

Interestingly, the control group in Twerton showed an overall reduction in water use following the intervention period and the control group in Moorfield showed an increase in water use of a similar magnitude (Figure 9). Combined, this is a reduction of 0.3% for the control groups.

The change in water use per block can be normalised to exclude external influences, such as the weather, by using the average change for the control blocks to allow calculations of water savings to be made.

The District Metering Areas (DMA) which cover the Twerton area could have been used to normalise the data however they show the demand from houses as well as flats and therefore the change in demand between summer and winter will not be representative of changes experienced in flats alone. Graphs of these two DMAs are included in Appendix 10.

The normalised consumption for the individual blocks is shown below in Figure 10 below.

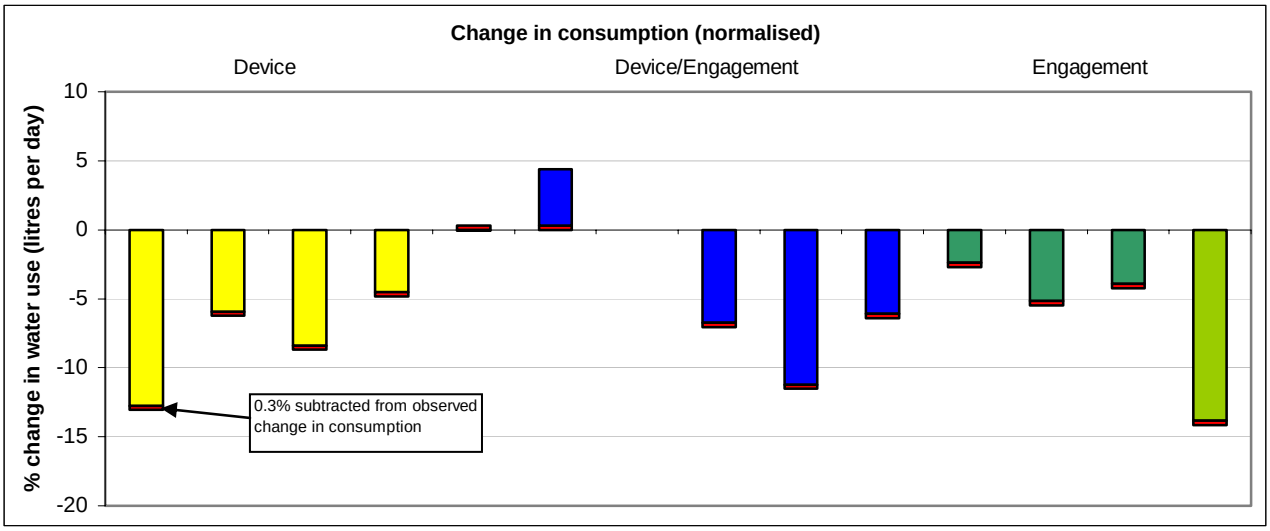


Figure 10: The result of normalising the changes observed in the intervention blocks

Normalising the observed savings results in a slight reduced level of savings in the blocks and the change in consumption for block D5 is now positive.

The savings calculated per visit are presented below.

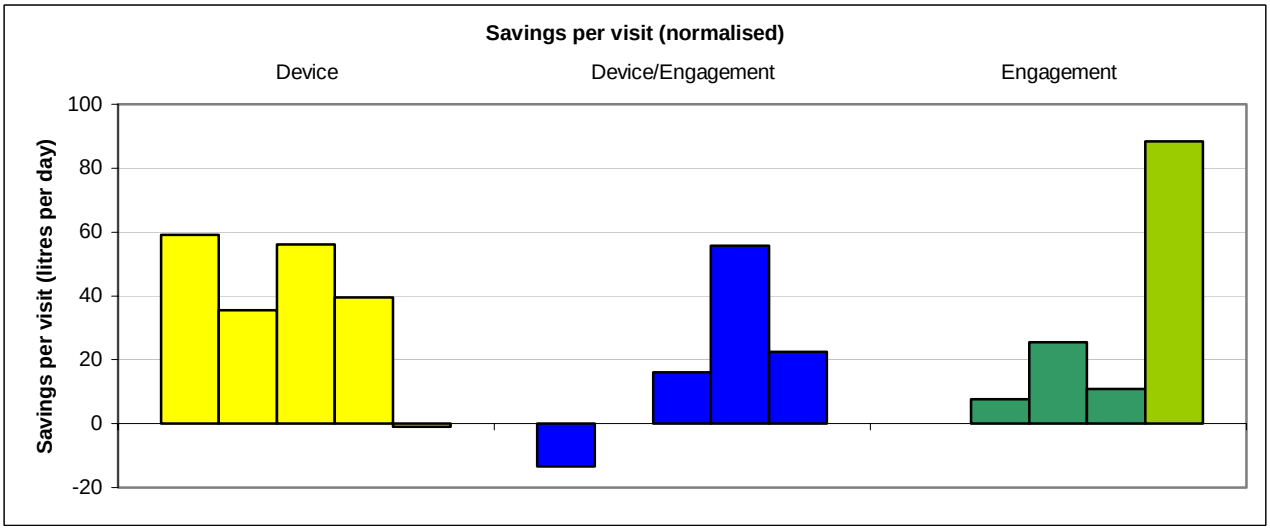


Figure 11: The savings achieved per visit

5.2.2 'Device only' group findings

The calculated savings per device range from -1 to 59 litres per flat per day. The four blocks which show greater savings range from 36 to 59 litres/flat/day.

Other research trials have shown savings from an Ecobeta to be in the order of 29 litres per property per day. There are a few possible explanations to explain this difference-

- The original flush sizes in the flats in this trial could be larger (nine litres) and therefore have potential to save greater volumes.
- There may be higher occupancy rates in these flats than in other trials. However the data collected by plumbers suggests an average occupancy rate per block of between 1.2 to 2.7.
- A large proportion of the residents are unemployed so the occupiers may spend more time at home than average, and therefore flush the toilet more than the average 4.2 times a day.
- It is possible that having the Ecobeta installed in their flat provoked residents to think more about the water they use in their home, resulting in reduced use through behavioural changes in other areas of their flat.
- Maintenance may have been carried out on fittings in the flat which reduced water use.

The average change in water use for all the blocks following the interventions was 6.3%, which is higher than the device and education blocks and higher than the education only blocks if block E5 is excluded from analysis.

5.2.3 'Engagement only' group findings

These figures are calculated based on the number of householders the canvassers participated in discussions with, and do not take into account the *'Water saving in your home'* leaflets which were left for residents who had not been at home for the three occasions when the canvassers made their visit. The 'per visit' savings figures are therefore slightly overestimated.

The savings made from the 'engagement only' interventions range from 7 litres per visit per day to 88 litres per visit per day, however the 88 l/visit/ day for block E5 appears to be an outlier. The raw data in PMAC shows no obvious reason why the consumption dropped and the graph E5 in Figure 5 does show the trend to occur immediately after the intervention period.

The savings from the engagement intervention group are generally lower than those from the device group. The majority of the residents are unmetered customers and therefore do not have the financial incentive to reduce their water use and therefore are less likely to change their behaviour.

Savings from education initiatives may reduce over time as people resume their former behavioural activities. The graphs in Figures 4 and 5 do not indicate this has occurred within approximately three months of post installation monitoring.

5.2.4 'Device and engagement' group findings

The savings per visit range from 56 litres per flat per day to 16 litres per flat per day and block DE1 shows an increase in consumption by 13 litres per visit.

These results show the savings made in the device and education groups to be less than those in the device only group, which is counterintuitive. If the plumbing and canvassing visits had been made to the flats at the same time, the combined effect of the device plus education could have been analysed.

5.2.5 Summary of observations

- The consumption pattern varies over time, with periods of slightly higher consumption however there is no obvious peak summer demand. This could be because 2008/09 was a wet year and also flats do not use as much water in the summer as properties with gardens.
- No clear weekly trends are observed in the data which could be due to irregular working patterns and weekend work.
- The average consumption per person during the baseline monitoring period varies from 98 l/p/d to 194 l/p/d (excluding DE2, CT4 and CM3). The Wessex Water region average demand is 150 l/p/d for unmetered customers and includes those with gardens, therefore the figure of 194 l/p/d seems high, questioning the accuracy of the occupancy rates.
- The change in consumption per block varies between a 13% increase in water used to a 15% decrease in water used.
- Considering only the blocks which received interventions, 11 out of 13 showed a decrease in consumption and the change ranges from a 14% decrease to a 4% increase. In comparison, the 8 control blocks showed considerable variation in consumption, with 3 of the 8 showing a reduction in water use in the period after the interventions.
- The saving made per visit looks extremely high for many of the blocks, unrealistically so in some cases.
- Figure 9 shows that the greatest savings were made by the installation of the Ecobetas (if block E5 is excluded from analysis).

5.2.6 Limitations with data analysis

It is important to highlight the limitations to the data collected and the analysis carried out:

- Some of the blocks have short baseline monitoring periods of four to six weeks.
- The sample size is too small to be able to draw statistically significant conclusions from the data.
- There are periods of missing data when the loggers were not functioning properly.
- The data collected for the intervention groups was normalised using the change observed in both the control groups. It could be argued that using the Moorfields data alone would have been more appropriate as it is outside the Twerton area, and therefore not affected at all by the other interventions.
- In calculating the savings per visit, it is assumed that all the savings are a result of the visits. Residents could have spoken to their neighbours about the visit and passed on information, which could explain the high savings experienced in some of the blocks.

- The number of people in the flats is believed to vary over time, and a low confidence level is associated with the occupancy data provided by SCHT.

5.3 Trial costs

The costs incurred for all the intervention activities are detailed in Table 9 below and costs for the whole trial are given in Table 10.

Table 9: Cost for all intervention materials and staff time

Intervention	Item	Unit cost (£)	Number	Total (£)
D/DE	Ecobetas	9.75	67	653.25
E/DE	*Save a flush*	0.90	41	36.90
E/DE	Shower timers	3.00	31	93.00
E/DE	Leaflets	0.49	128	62.72
E/DE	Magnets	0.61	57	49.41
E/DE	Staff- fieldwork	1603.98	1	1603.98
D/DE	Staff- plumbing	1409.94	1	1409.94
				3909.2

Table 10: Total trial cost

Item	Cost
Monitoring	
Metering materials	£15,263
Metering staff time	£19,228
Logging materials	£14,597
Logging staff time	£25,752
Interventions	
RF staff time	£2,906.26
WW staff time	£3,600.00
Plumbers- Oct +Feb visits	£1,997.42
Materials	£895.28
Total	**£84, 238.96**

5.4 Cost benefit analysis

A simple cost benefit analysis was carried out to compare the cost of each intervention with the savings it achieved. The costs for installing the meters and loggers on the blocks and for administration were excluded for this analysis. In order to be able to calculate the cost benefits of the interventions, it is assumed that the benefits are 100% attributable to the costs.

5.4.1 Devices

Thirty-four devices were installed and were left in place in the 'device only' group, so the cost of the plumbers' time is taken to be half of that outlined in Table 9, as the other 50% time was spent installing devices in the device and engagement blocks. The overall savings in the 'device only' group were on average 1,281 litres per day.

Table 11: Costs and savings for the device only intervention group

Item	Unit cost (£)	Number	Total (£)	Water saved (l/day)	Cost per litre saved/day
Ecobetas	9.75	34	331.50		
Plumbers	704.97 (50% total time)	1	704.97		
			1036.47	**1,281**	**£0.81**

This gives a cost of £0.81 per litre saved per day or £810,000 per Megalitre saved/d, however over time there may be deterioration of the devices (Waterwise estimates the asset life of the Ecobeta to be 10 years) or they may get removed over time and yields may therefore not be sustained without additional investment.

5.4.2 Engagement

For the purpose of this analysis, the Resource Futures' cost for the fieldwork only is considered. It is assumed that the water saving day had no effect on water use as only two people attended, the cost incurred for this are therefore excluded. The costs of the leaflets left when residents were not at home are included in this analysis.

Calculation including block E5

The cost per litre per day for the 'engagement only' blocks was calculated using Table 12 below. Thirty-three of the flats in the engagement only blocks (excluding E1) received visits and savings of 1002 litres per day were made.

Table 12: Costs and savings for the engagement only intervention group, including E5

Item	Unit cost (£)	Number	Total (£)	Water saved (l/day)	Cost per litre saved/day
Save a flush	0.90	32	28.80		
Shower timers	3.00	18	54.00		
Leaflets	0.49	60	29.00		
Magnets	0.61	22	13.42		
Staff	673.68 (42% of total time)	1	673.68		
			799.3	**1002**	**£0.78**

Calculation excluding E5

If block E5 is excluded, 26 of the flats received visits and savings of 383 litres per day were calculated.

Table 13: Costs and savings for the engagement only intervention group, excluding E5

Item	Unit cost (£)	Number	Total (£)	Water saved (l/day)	Cost per litre saved/day
Save a flush	0.90	25	22.50		
Shower timers	3.00	13	39.00		
Leaflets	0.49	44	21.56		
Magnets	0.61	16	9.76		
Canvassers	529.32 (33% of total time)	1	**529.32**		
			622.14	**383**	**£1.62**

When E5 is included the calculated cost is £0.78/litre saved/day or £780,000/Megalitre saved/day. Excluding E5 gives cost of £1.62/litre/day or £1,620,000/Megalitre/day. These savings are attributed to behavioural change and if the messages given have not been embedded, the residents could revert to former behaviour as time passes. Future campaigns could be needed to further promote water efficiency and to sustain the savings.

5.4.3 Device and engagement

Thirty three visits were made by the plumbers and 35 visits were made by the canvassers. 18 blocks received both interventions. The time and material costs were disregarded for block DE2 as the savings are not included. The costs of the leaflets left when residents were not home were included in this analysis. The total cost for the interventions was £1601.73 and 787 litres a day were saved.

Table 14: Costs and savings for the device and engagement group

Item	Unit cost (£)	Number	Total (£)	Water saved (l/day)	Cost per litre saved/day
Save a flush	0.90	0	0.00		
Shower timers	3.00	8	24.00		
Leaflets	0.49	68	33.32		
Magnets	0.61	24	14.64		
Canvassers	616.90 (38% of total time)	1	616.90		
Ecobeta	9.75	30	292.50		
Plumber	620.37 (44% time)	1	620.37		
Total			**1601.73**	**787.3**	**£2.03**

This gives a cost of £2.03 per litre saved per day, and £2,030,000 per Megalitre saved per day.

Combining these interventions would lead to a reduced cost for staff, which is the largest cost component. Using the average cost for the staff cost components, £618.64, the revised cost per litre saved per day is calculated to be £1.25.

5.4.4 Summary of cost benefit analysis

A summary of the cost benefit analysis is given in Table 15 below.

Table 15: Summary of cost benefit analysis

Intervention	£ per litre/day
Device	0.81
Engagement including block E5	0.78
Engagement excluding block E5	1.62
Device and engagement	2.03
Revised device and engagement cost (see above)	1.25

The intervention which came out with the lowest cost per litre saved per day was the education only if the savings from E5 are included. If these savings are not included, then Ecobeta installation is the most cost effective initiative.

70% of the cost for the device only intervention was for the plumber's time. So the cost could be reduced if Ecobetas could be installed whilst tradesmen or plumbers are doing other work in homes.

Cost would also be reduced it appointment times were pre made, so time is not wasted going from door to door.

It is important to highlight that the initial savings recorded could decrease over time and the yield may not be sustained with just this level of investment. The Ecobeta and *Save a Flush* devices could be removed or degrade and residents may revert to former behavioural activity. Regular investment will therefore be required to sustain the observed level of water saving.

This analysis is also limited by the assumption made that all changes in consumption observed are attributable to the interventions.

6. EVALUATION OF PROJECT

The key findings, successes and limitations are highlighted below.

6.1 Key findings

High uptake rates: 45% of the targeted flats had an Ecobeta installed and 50% of the targeted engagement flats received advice and information from the canvassers. The high uptake rates may be attributed to the fact that residents are used to tradesmen and housing officers calling round.

Householders were satisfied with dual flush device: Only 3 people out of 54 spoken to following installation had removed the device. All the other respondents said they were using the short flush.

The residents are interested in water efficiency and are keen to talk and learn about it. However, the low turn out for the water saving day demonstrates that messages and interventions need be taken to the residents rather than relying on the residents being proactive.

11 out of 13 intervention blocks showed a decrease in water use following the interventions, whereas only 3 out of 8 of the control blocks showed a decrease, indicating that despite variability in consumption, the interventions had an effect.

The average savings made with Ecobeta were 6.3%. The Ecobetas were shown to be more effective in saving water than education alone, possibly because they do not rely on behavioural changes.

The reduction in consumption in areas where engagement visits were made is indicated to be in the order of 3.8% to 6.3%.

Bulk monitoring of flats removes the ability to fully examine water use patterns- for this individual properties would need to be monitored.

The results of the cost benefit analysis are inconclusive. The cost per litre saved is lower for the ‘education only’ blocks if the block E5 is included in the analysis, otherwise the ‘device only’ intervention is the most cost beneficial. A simple analysis was carried out which does not allow for the replacement of devices or further engagement activities needed to sustain the yield achieved. Due to the variability of the savings there is low confidence in the results.

There is potential to increase the cost effectiveness of device installation further if installation if device installation is carried out along with routine maintenance work in the flats.

6.2 Project limitations

Delays occurred at the start of the project as surveys to identify the location of supply pipes for meter fitting took longer than anticipated. The monitoring period was further shortened due to the delays in receiving parts of the loggers cut down the baseline period.

A key limitation for the project was the length of the baseline monitoring period. In a few cases the average daily volumes following the intervention period are compared to only four to six weeks' worth of data collected before the interventions. Extensive baseline data is important to be able to understand patterns in water use, especially as it is subject to seasonal change.

Data was recorded using bulk meters. Although this simplified installations and sped up the data collection it caused complications when analysing the data set. Daily profiles were hidden due the data being a combined output from 10 or more flats. It is possible to see overall trends in data, but difficult to calculate savings per device.

The calculations for saving per visit assume that all reductions in water use are attributed to the visits, although other factors such as seasonality, maintenance and occupancy rates may have influenced the amount of water used.

The combined effect of education and devices could not be accurately calculated owing to limited coordination between plumbing and canvassing teams- future projects should seek to improve on this.

The blocks of flats were split up to compare the effect of different water efficiency measures, however it is likely that messages spread between the blocks due to the area being a close knit community. Also, the installation of the devices could have had a roll on effect of people thinking more about water use and changing their behaviour.

Knowledge of occupancy data is critical to determining and understanding the per capita consumption and the savings per visit. Although SCHT provided information about when flats were vacant, no records are available of when people were away over weekends or had visitors staying. Although asking the residents to keep water use diaries was considered, it was felt that the majority of people would not fill them in.

6.3 Future work

Working in partnership with Housing Associations has the potential to be a cost-effective way of promoting water efficiency. Costs could be cut down by asking Housing Association tradesmen to install Ecobetas or *Save A Flush* devices when they visit flats for other jobs.

The results shown for the education only intervention suggest that offering household audits to customers would be an effective initiative to promote. The majority of households receiving interventions in this study were unmetered, and there could be scope for further savings with metered customers who have a financial incentive to save water.

APPENDIX 1: COMPARISON OF STUDY BLOCKS

Name of block	No of flats	No residents	No flats with meters	No owner occ flats	Type of housing	Types of social mix	Issues	Problems	External water supply	Other
D1	18	34	0	1	Flats and maisonettes 1/2 beds	?	No issues at present	Low Management issues	yes	Firehose problems
D2	16	37	1	0	Flats and Maisonettes 1/2 beds	?	ASB/G/LM	Some Management issues	yes	Firehose problems / SOMER area office next door
D3	18	36	1	0	Flats and maisonettes 1/2 beds	?	U/R	Some Management issues	yes	Firehose problems
D4	10	15	2	2	Flats 1/2 beds	?	No issues at present	Low Management issues	no	
D5	16	18	2	0	1bed/2 bed flats	?	No issues at present	Low Management issues	no	
DE1	18	30	1	0	Flats and Masonettes 1/2 beds	?	No issues at present	Low Management issues	yes	
DE2	10	18	1	2	1 bed flats/2 bed flats	?	D / ASB / V / U	High Management issues	no	
DE3	16	20	1	3	1 bed flats/2 bed flats	?	D / ASB / V / U	High Management issues	no	
DE4	16	23	2	0	1 bed flats/2 bed flats	?	D / ASB / V / U/LM	High Management issues	no	
DE5	18	38	2	0	Flats and maisonettes 1/2 beds	?	U/R	Some Management issues	yes	Firehose problems
E1	18	37	1	3	Flats and Masonettes 1/2 beds	?	No issues at presentlow	Low Management issues	yes	Firehose problems
E2	12	11	1	0	1 bed flats	50+	No issues at present	No Management issues	no	
E3	16	33	0	1	studio/1/2 bed flats	1 / 1+/2+	LM/U/R/D/ASB	High Management issues	no	
E4	16	29	0	2	studio/1/2 bed flats	1 / 1+/2+	V/LM	Some Management issues	no	
E5	16	33	2	2	Studio/1/2 bed flats	?	U/R	Some Management issues	no	
CT1	16	34	0	3	Studio/1/2 bed flats	?	U/R	Some Management issues	yes	
CT2	16	30	0	0	Studio/1/2 bed flats	?	D / ASB / V / U	High Management issues	no	
CT3	16	30	0	1	Studio/1/2 bed flats	?	V/LM/D/ASB	High Management issues	no	
CT4	10	20	2	1	Flats 1/2 beds	?	No issues at present	Low Management issues	no	
CM1	16	26	4	6	Bedsits/1 bed flats/2 bed flats	S/1+/2+/unemp	LM/R/U/ASB	High Management issues	no	
CM2	16	26	6	3	Bedsits/1 bed flats/2 bed flats	S/1+/2+/unemp	LM/R/U	Low Management issues	no	
CM3	16	25	3	7	Bedsits/1 bed flats/2 bed flats	S/1+/2+/unemp	LM	Low management issues	no	
CM4	16	32	6	4	Bedsits/1 bed flats/2 bed flats	S/1+/2+/unemp	LM/ASB	High Management issues	no	
CM5	16	30	7	1	Bedsits/1 bed flats/2 bed flats	S/1+/2+/unemp	LM/ASB/V/D	High Management issues	no	
	372	665	45	42						

Key to intervention types

80	Control group - no internentions
58	Control group - no internentions
78	Installing of devices only
76	Installation and engagement
78	Engagement only

Total no of flats: 370

Key to social mix	Key to issues
50+ = mainly over 50's	D = Drug use
1+ = single parent families	ASB = Anti-social behaviour
2+ = families	V =Vandalism
S = single person	LM =Loud music
Unemp = largely unemployed	U = Untidyness
Emp = largely employed	R = Rubbish/Litter
Mixed = large social mix	G = Grafitti

APPENDIX 2: ATTITUDINAL SURVEY QUESTIONNAIRE

Water Use Questionnaire - Resource Futures

We're doing a survey about the environment and how people use water. It's research we're doing for the Environment Agency and will not take more than 10-15 minutes. There is a prize draw with it. Do you have the time?

We are not telling you how you <u>should</u> use water - we are just asking you how you <u>do</u> use it. There are no right or wrong answers to the questions.

Q0a **Block** _____

Q0b **Flat Number** _____

Q0c **Surveyor name** _____

Q1 **Where does the water from your tap come from? (Select only one. Do not prompt)**

- ❑ 1 *A reservoir*
- ❑ 2 *A well*
- ❑ 3 *A river*
- ❑ 4 *Bore hole or aquifer*
- ❑ 5 *Wessex Water*
- ❑ 6 *Don't know*
- ❑ 7 *Other*

Q2 **How much do you agree or disagree with the following statement: "Everyone needs to do what they can to reduce the waste of water" (Select only one. Prompt)**

- ❑ 1 *Strongly agree*
- ❑ 2 *Tend to agree*
- ❑ 3 *Neither agree nor disagree*
- ❑ 4 *Tend to disagree*
- ❑ 5 *Strongly disagree*
- ❑ 6 *Don't Know*

Q3 **How important is saving water to you personally? (Select only one. Prompt)**

- ❑ 1 *Very important*
- ❑ 2 *Fairly important*
- ❑ 3 *Neither important nor unimportant*
- ❑ 4 *Not very important*
- ❑ 5 *Not at all important*

Q4 **Which of these statements best describes your attitude to saving water? ((Select only one. Prompt)**

- ❑ 1 *I save water even if it requires additional effort*
- ❑ 2 *I save water if it does not require additional effort*
- ❑ 3 *I do not save water*
- ❑ 4 *Don't know*

REPORTED WATER USAGE - BEHAVIOURAL BASELINE (USAGE)

Q5 **How many times a day does your household…**

Q5a Flush the toilet _____

Q5c Use tap (not bottled) water for drinking _____

Q6 **How many times a week does your household…**

Q6a	Use a washing machine	_____
Q6b	Take a bath	_____
Q6c	Take a shower	_____
Q6d	Wash clothes by hand	_____
Q6e	Use a dishwasher	_____
Q6f	Wash dishes by hand	_____

REPORTED WATER SAVING - REPETITIVE BEHAVIOURS

Go to Q11 if Q4 response was "I do not save water"

Q7 **How often do you do any of the following to save water? (Prompt)**

		Never	*Sometimes*	*Always*	*N/a*
Q7a	Turn tap off while brushing teeth	❑ 1	❑ 2	❑ 3	❑ 4
Q7b	Turn tap off while doing dishes	❑ 1	❑ 2	❑ 3	❑ 4
Q7c	Use appliances on full loads only	❑ 1	❑ 2	❑ 3	❑ 4
Q7d	Take short showers	❑ 1	❑ 2	❑ 3	❑ 4
Q7e	Take showers rather than baths	❑ 1	❑ 2	❑ 3	❑ 4
		❑	❑	❑	❑
Q7g	Use a bucket, not a hose, to wash a car	❑ 1	❑ 2	❑ 3	❑ 4
Q7h	Fix dripping taps or leaks (or request that they get fixed)	❑ 1	❑ 2	❑ 3	❑ 4

REPORTED WATER SAVING - ONE-OFF BEHAVIOURS

Q8 **In the last 3 years, have you ever made any changes to your home, or any previous home, in order to save water?**

❑ 1	Go to Q9	*Yes*
❑ 2	Go to Q11	*No*
❑ 3	Go to Q11	*Don't know*

Ask if "yes" at 8 above

Q9 **Which of the following changes did you make?** ***(Prompt, multi-code)***

- ❑ 1 *Fitted water saving devices to toilets to reduce the amount of water that flushes (e.g. Hippo, Save a flush bag)*
- ❑ 2 *Had a water meter installed*
- ❑ 3 *Put in a dual flush cistern or toilet*
- ❑ 4 *Fitted water saving shower heads*
- ❑ 5 *Fitted tap inserts that reduce flow*
- ❑ 6 *Bought appliances such as washing machines that are more water efficient*
- ❑ 7 *Fitted water butts / rainwater harvesting equipment*
- ❑ 8 *Other (Please specify)…….*

Q9a **Other response to question above** _____

REPORTED MOTIVATIONS, BENEFITS & BARRIERS

Ask if "yes" at 8

Q10 **Why did you decide to take this/these water saving measure(s)?** ***(Prompt, multi-code)***

- ❑ 1 *Because it saves me money*
- ❑ 2 *Because I feel it is better for the environment*
- ❑ 3 *Prompted by my friends and neighbours*
- ❑ 4 *Prompted by my children*
- ❑ 5 *Because I felt responsible and wanted to do my bit*
- ❑ 6 *Other, please specify……..*

Q10a **Other response to question above** _____

Ask all

Q11 **What, if anything, prevents you from saving water/more water, at home?**
(Prompt, multi-code)

- ❑ 1 *I've never thought about saving water*
- ❑ 2 *I don't feel it's a priority ('we have so much water in the UK')*
- ❑ 3 *I do all I can already / don't know what more I can do*
- ❑ 4 *I can't be bothered, it's not easy*
- ❑ 5 *My actions won't make a difference*
- ❑ 6 *It's someone else's responsibility*
- ❑ 7 *It doesn't cost me anything more (whether I use a lot or a little)*
- ❑ 8 *Health & hygiene reasons*
- ❑ 9 *Other, please specify.*
- ❑ 10 *Don't know*

Q11a **Other response to question above** _____
Go to Q15

_____

_____

_____

PREFERRED INFORMATION CHANNELS

Q15 **Have you read, seen or heard about anything about saving water in the last 3-12 months?**

- ❑ 1 Go to Q16 *YES*
- ❑ 2 Go to Q17 *NO*

Ask if "yes" at question 15 above

Q16 **Please describe where you came into contact with this/these water saving issues?**
(Do not prompt, *multi-code)*

- ❑ 1 *Council publications, e.g. website*
- ❑ 2 *Water company*
- ❑ 3 *Plumber*
- ❑ 4 *Friends & family*
- ❑ 5 *Schools*
- ❑ 6 *Environment Agency*
- ❑ 7 *Newspaper*
- ❑ 8 *Environmental Organisations (e.g. Friends of the Earth)*
- ❑ 9 *DIY stockists (e.g. B&Q)*
- ❑ 10 *Water festival*
- ❑ 11 *Internet*
- ❑ 12 *TV*
- ❑ 13 *Other, please specify*
- ❑ 14 *Somer Community Housing Trust ('The Trust')*

Q16a **Other response to question above** _____

Ask all

Q17 **How interested would you be to find out more about water saving in the home? (Prompt, select only one)**

- ❑ 1 Go to Q18 *Very interested*
- ❑ 2 Go to Q18 *Quite interested*
- ❑ 3 Go to Q19a *Not very interested*
- ❑ 4 Go to Q19a *Not at all interested*

Ask if "very" or "quite interested" in Q17 above

Q18 **Where might you look for water saving tips and information? (Do not prompt, *multi-code)***

- ❑ 1 *Council publications, e.g. website*
- ❑ 2 *Water company*
- ❑ 3 *Plumber*
- ❑ 4 *Friends & family*
- ❑ 5 *Environment Agency*
- ❑ 6 *Newspaper*
- ❑ 7 *Environmental Organisation*
- ❑ 8 *DIY stockists (e.g. B&Q)*
- ❑ 9 *Water festival*
- ❑ 10 *Internet*
- ❑ 11 *TV*
- ❑ 12 *Other, please specify*
- ❑ 13 *Somer Community Housing Trust ('The Trust')*

Q18a **Other response to question above** _____

Ask all

Q19 **I'm going to read out a number of comments other people have made about water saving issues. For each one, please state whether you personally agree or disagree, using a scale of 1 to 10 where 1 means completely disagree and 10 means completely agree. (Read out)**

Q19a	'I am completely confused about what actions I can take to save water'	_____
Q19b	'I don't know how much water I use, or how much I might be wasting'	_____
Q19c	'I don't really understand why saving water is an important issue around here'	_____
Q19d	'I think there are too many do gooders telling the public what they should and shouldn't do regarding the environment'	_____
Q19e	'I'm afraid at the end of the day, the only thing that will make me reduce my consumption of water significantly is if the price shoots up'	_____
Q19f	'I don't understand why people waste water – it's really easy to use it sensibly'	_____ Go to Q21

SOCIO-DEMOGRAPHIC / HOUSEHOLD DATA

Q21 **Do you have a water meter?**

- ❑ 1 *Yes*
- ❑ 2 *No*
- ❑ 3 *Don't know*

Q22 **Do you have a garden?**

- ❑ 1 *Yes*
- ❑ 2 *No*

Q23 **Please describe the type of property you live in (Select only one)**

- ❑ 1 *House or Bungalow: Detached*
- ❑ 2 *House or Bungalow: Semi-detached*
- ❑ 3 *House or Bungalow: Terraced (including end-terrace)*
- ❑ 4 *Flat, Maisonette or Apartment: In a Purpose-Built Block of Flats*
- ❑ 5 *Flat, Maisonette or Apartment: Part of a Converted or Shared House*
- ❑ 6 *Flat, Maisonette or Apartment: In a Commercial Building*
- ❑ 7 *Caravan or Other Mobile or Temporary Structure*

Q24 **Do you rent your accommodation**

- ❑ *yes*
- ❑ *No*

Q25 **Number of people in household** _____

Q26 **How many of these (including yourself) are females aged...**

0-3..	_____
3-6	_____
6-13	_____
13-18	_____
19-24	_____
25-44	_____
45-64	_____
65-74	_____
Over 74	_____

Q27 **How many of these (including yourself) are males aged...**

0-3..	_____
3-6	_____
6-13	_____
13-17	_____
18-24	_____
25-44	_____
45-64	_____
65-74	_____
Over 74	_____

Q28 **Respondent's age group**

- ❑ 1 *18-24*
- ❑ 2 *25-44*
- ❑ 3 *45-64*
- ❑ 4 *65-74*
- ❑ 5 *Over 74*

Q29 **Which of the following best describes your employment status**

- ❑ 1 *Employed*
- ❑ 2 *Unemployed*
- ❑ 3 *Student*
- ❑ 4 *Retired*

Go to Q31

_____

Q31 **Respondent's gender (Do not ask)**

- ❑ 1 *Female*
- ❑ 2 *Male*

Thank you very much for your time
If you wish to enter the prize draw, please enter your contact details

Name:_____

Tel No:_____

Address:

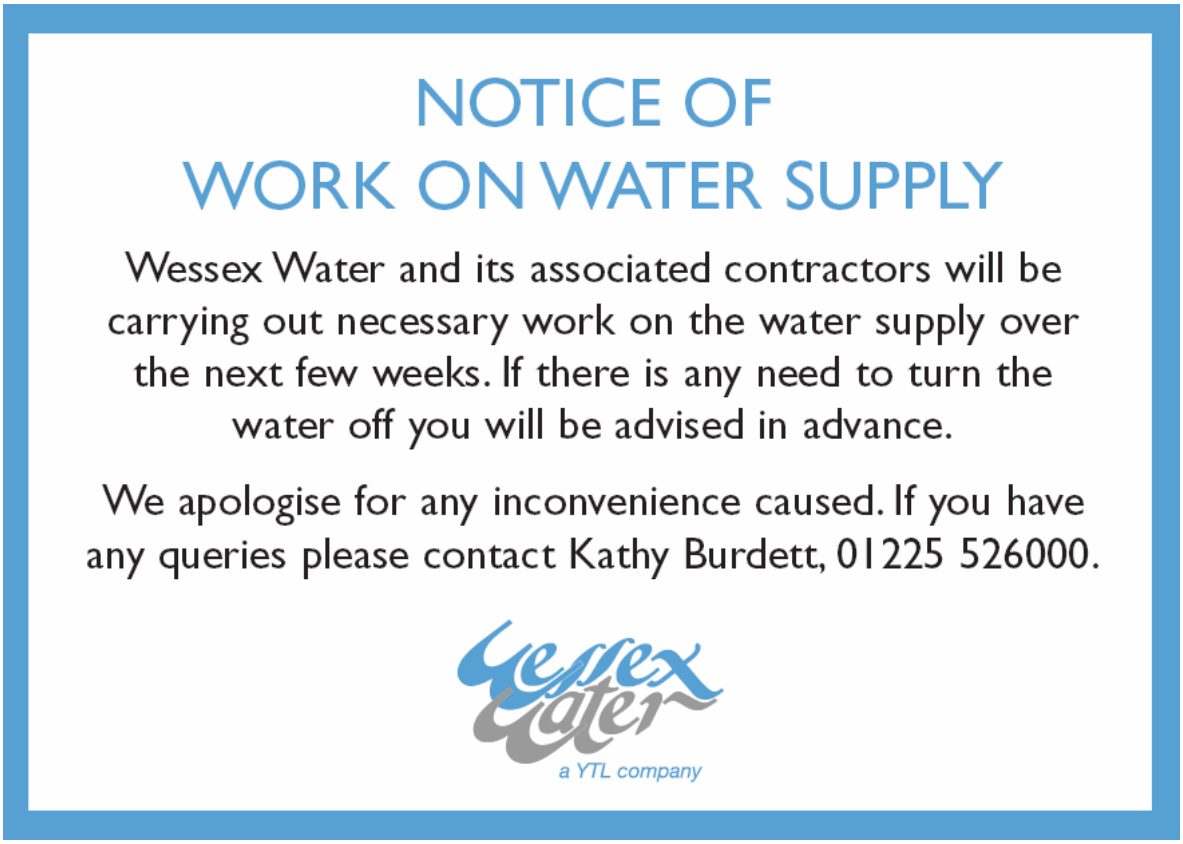
This information will not be used for any other purposes than the prize draw. Winners will be notified by 30th June 2008, and published on www.resourcefutures.co.uk

"Are you willing to be included in some local publicity if you are one of the prize winners?"

Yes

No

APPENDIX 3: NOTICE PUT IN BLOCKS PRIOR TO METER INSTALLATION



APPENDIX 4: DETAILS OF METER AND LOGGER INSTALLATIONS

Group	Block	No meters	Meter installation date	Logger installation date	Monitoring period for analysis
Device Only	**D1**	2	01-Feb	04-Sep	04/09 to12/10 and 24/10 to 30/12
	D2	2	07-Apr	17-Jul	17/07 to12/10 and 24/10 to 07/12
	D3	2	19-Jun	17-Jul	17/07 to12/10 and 24/10 to 20/01
	D4	1	20-Feb	23-May	05/06 to 12/10 and 24/10 to 22/12
	D5	2	14-Feb	24-Apr	24/04 to 29/07 and 24/10 to 20/01
Engage + device	**DE1**	1	13-Mar	24-Apr	24/04 to 30/09 and 24/10 to 19/01
	DE2	1	07-Feb	24-Apr	21/04 to 30/09 and 24/10 to 20/01
	DE3	1	06-Feb	24-Apr	24/04 to 30/09 and 24/10 to 20/01
	DE4	2	05-Feb	24-Apr	24/04 to 05/09 and 24/10 to 20/01
	DE5	2	13-Feb	04-Sep	04/09 to 30/09 and 24/10 to 21/12
Engage	**E1**	2	25-Mar	x	
	E2	1	25-Jan	24-Apr	24/04 to 30/09 and 08/10 to 20/01
	E3	2	08-Jan	23-May	23/05 to 30/09 and 08/10 to 20/01
	E4	2	09-Jan	23-May	23/05 to 30/09 and 08/10 to 20/01
	E5	2	20-Mar	23-May	23/05 to 30/09 and 08/10 to 20/01
Control Twerton	**CT1**	2	15-Jan	23-May	23/05 to 30/09 and 24/10 to 20/01
	CT2	2	16-Jan	24-Apr	24/04 to 30/09 and 24/10 to 20/01
	CT3	2	17-Jan	25-Apr	25/04 to 30/09 and 24/10 to 20/01
	CT4	1	18-Feb	25-Jun	25/06 to 30/09 and 24/10 to 20/01
Control Twerton	**CM1**	2	28-Feb	25-Jun	25/06 to 30/09 and 24/10 to 20/01
	CM2	2	14-Mar	25-Jun	25/06 to 30/09 and 24/10 to 20/01
	CM3	2	21-Feb	25-Jun	25/06 to 30/09 and 24/10 to 20/01
	CM4	2	16-Apr	x	
	CM5	2	31-Mar	25-Jun	25/06 to 30/09 and 24/10 to 20/01

APPENDIX 5: PLEDGE CARD

WATER... EVERY DROP COUNTS

PLEDGE CARD

I pledge to do all I can to save water (see over)

Name _____

Address _____

_____

Phone _____

At the end of 4 weeks please return this slip in the reply-paid envelope or hand it in to the Somer area office at Meade House for a chance to win one of 10 water-saving eco-kettles! Winners will be drawn at random from all those entering a pledge card - regardless of how many boxes are ticked overleaf. Winners will be notified by the end of December 2008

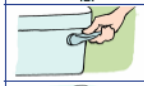
Wessex Water a YTL company

If you want advice about filling in this card please ring Resource Futures on 0117 914 3447

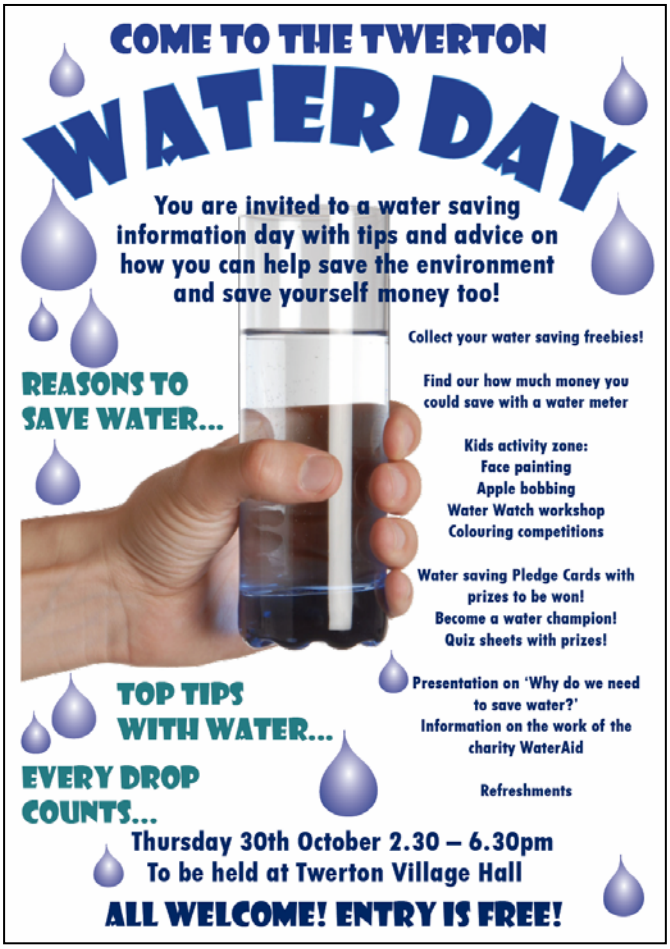
SOMER Community Housing Trust

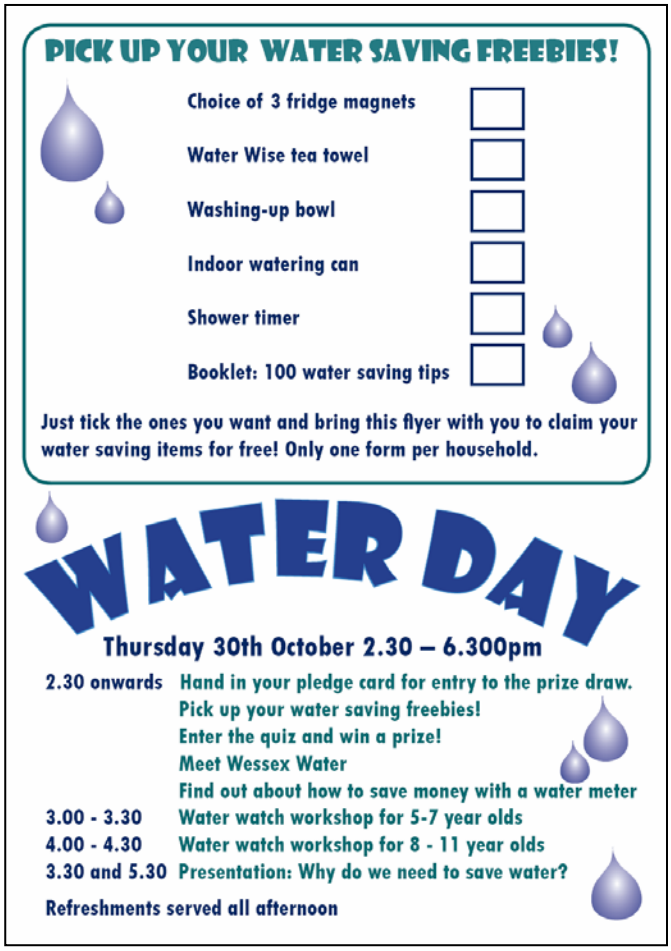
- Please do as many of these actions, as often as you can, every week.
- When you feel you are doing it regularly, then tick the box.
- At the end of 4 weeks hand this pledge card in - it doesnt matter if you haven't ticked every box, you have still made a difference!

WATER PLEDGE CARD

	week 1	week 2	week 3	week 4
Date at start of week:				
WASHING: Filled the basin with 3/4 of the amount that I normally put in				
BATHING: I ran a bath with 2 inches (5cm) less water than I normally put in. Put crosses in these boxes if you take showers instead of baths				
CLOTHES WASHING: Washed on full load / used a shorter cycle in the washing machine				
BRUSHING TEETH: I turned the tap off while brushing my teeth				
 **FLUSHING THE LOO:** Put a 'save-a-flush' in the cistern, saving 1 litre with every flush				
SHOWERING: I cut 1 or 2 minutes off my normal showering time. Put crosses in these boxes if you dont have a shower in your home				
WATERING: Used bath water for watering my house plants. Put crosses in these boxes if you dont have any house plants				

APPENDIX 6: WATER DAY PROMOTIONAL LEAFLET





APPENDIX 7: POST INTERVENTION ATTITUDINAL SURVEY

Please just put a tick on the correct box (☑), and check the question instructions. if you are not sure what to do, ring Agnes on 0117 914 4958.

1. How much do you agree or disagree with the following statement? "Everyone needs to do what they can to reduce the waste of water" (Please select only one)

- ❑ 1 *Strongly agree*
- ❑ 2 *Tend to agree*
- ❑ 3 *Neither agree nor disagree*
- ❑ 4 *Tend to disagree*
- ❑ 5 *Strongly disagree*

2. How important is saving water to you personally? (Please select only one)

- ❑ 1 *Very important*
- ❑ 2 *Fairly important*
- ❑ 3 *Neither important nor unimportant*
- ❑ 4 *Not very important*
- ❑ 5 *Not at all important*

3. Which of these statements best describes your attitude to saving water? (Please select only one)

- ❑ 1 *I save water even if it requires additional effort*
- ❑ 2 *I save water if it does not require additional effort*
- ❑ 3 *I do not save water*
- ❑ 4 *Don't know*

4. How often do you do any of the following to save water? (tick one box for each)

	Never	*Sometimes*	*Always*	*N/a*
Turn tap off while brushing teeth	❑	❑	❑	❑
Turn tap off while doing dishes	❑	❑	❑	❑
Use appliances on full loads only	❑	❑	❑	❑
Take short showers	❑	❑	❑	❑
Take showers rather than baths	❑	❑	❑	❑
Use a watering can, not a hose, to water a garden	❑	❑	❑	❑
Use a bucket, not a hose, to wash a car	❑	❑	❑	❑
Fix dripping taps or leaks (or request that they get fixed)	❑	❑	❑	❑
Flush toilet less often	❑	❑	❑	❑

5. Have you made any of the following changes in the last year? ***(You may give more than one answer)***

❑ 1	*Fitted water saving devices to toilets to reduce the amount of water that flushes (e.g. Hippo, Save-a-flush (bag in the cistern))*	❑ 5	*Fitted tap inserts that reduce flow*
❑ 2	*Had a water meter installed*	❑ 6	*Bought appliances such as washing machines that are more water efficient*
❑ 3	*Put in a dual flush system*	❑ 7	*Fitted water butts / rainwater harvesting equipment*
❑ 4	*Fitted water saving shower heads*	❑ 8	*Other (please specify below)*

Please enter other response here:

6. **If you did make such changes, please tell us why**
(You may give more than one answer)

❑ 1	*Because it saves me money*	❑ 5	*Prompted by my children*
❑ 2	*Because I feel it is better for the environment*	❑ 6	*Because I felt responsible and wanted to do my bit*
❑ 3	*A leaflet came through my door*	❑ 7	*Other, please specify below*
❑ 4	*Prompted by my friends and neighbours*	❑ 8	*Someone came to my door*

Please enter other response here:

7. **Have you experienced any of the following in the last year?**
(You may give more than one answer)

❑ 1	*Someone coming to your door to talk about saving water*	❑ 4	*A community event or talk about saving water*
❑ 2	*Someone calling you on the phone to talk about saving water*	❑ 5	*An advert in the press about saving water*
❑ 3	*A leaflet through the door about saving water*	❑ 6	*A visit by a plumber about saving water*

8. **If you ticked any of the boxes above, has this experience encouraged you to save more water now?**

❑ 1 *Yes* ❑ 3 *N/a*
❑ 2 *No* ❑ 4 *Don't know*

9. **Do you have a water meter?** ❑ 1 *Yes* ❑ 2 *No* ❑ 3 *Don't know*

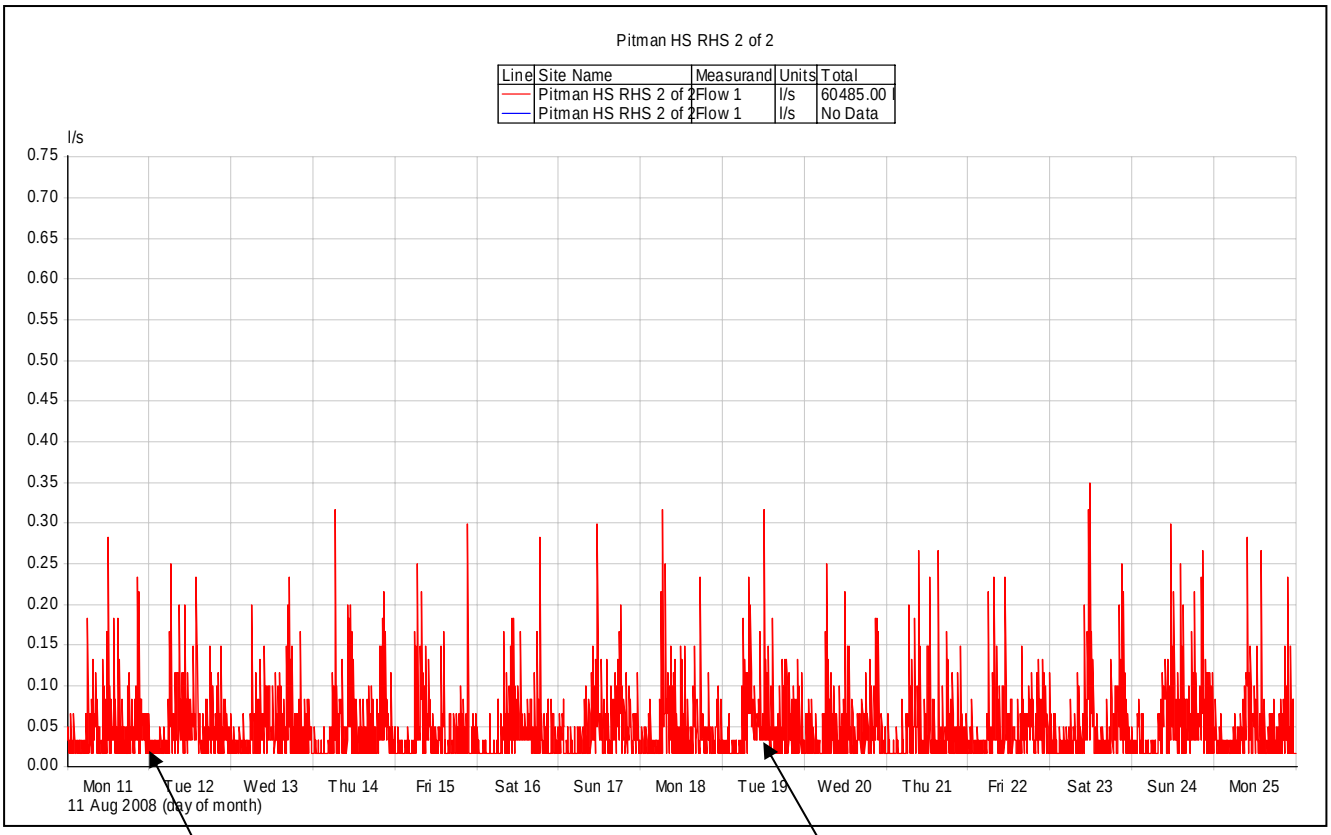
10. **Please tick the box for your age group**

❑ 1 *18-24* ❑ 4 *65-74*
❑ 2 *25-44* ❑ 5 *Over 74*
❑ 3 *45-64*

11. **What sex are you?** ❑ 1 *Female* ❑ 2 *Male*

Thank you very much!
Please send the completed questionnaire in the envelope provided to Box 203, Resource Futures, The Create Centre, Smeaton Road, BS1 6XN

APPENDIX 8: EXAMPLE OF A PMAC GRAPH



1. Observed leak at rate of xxl/s = xxm3/day

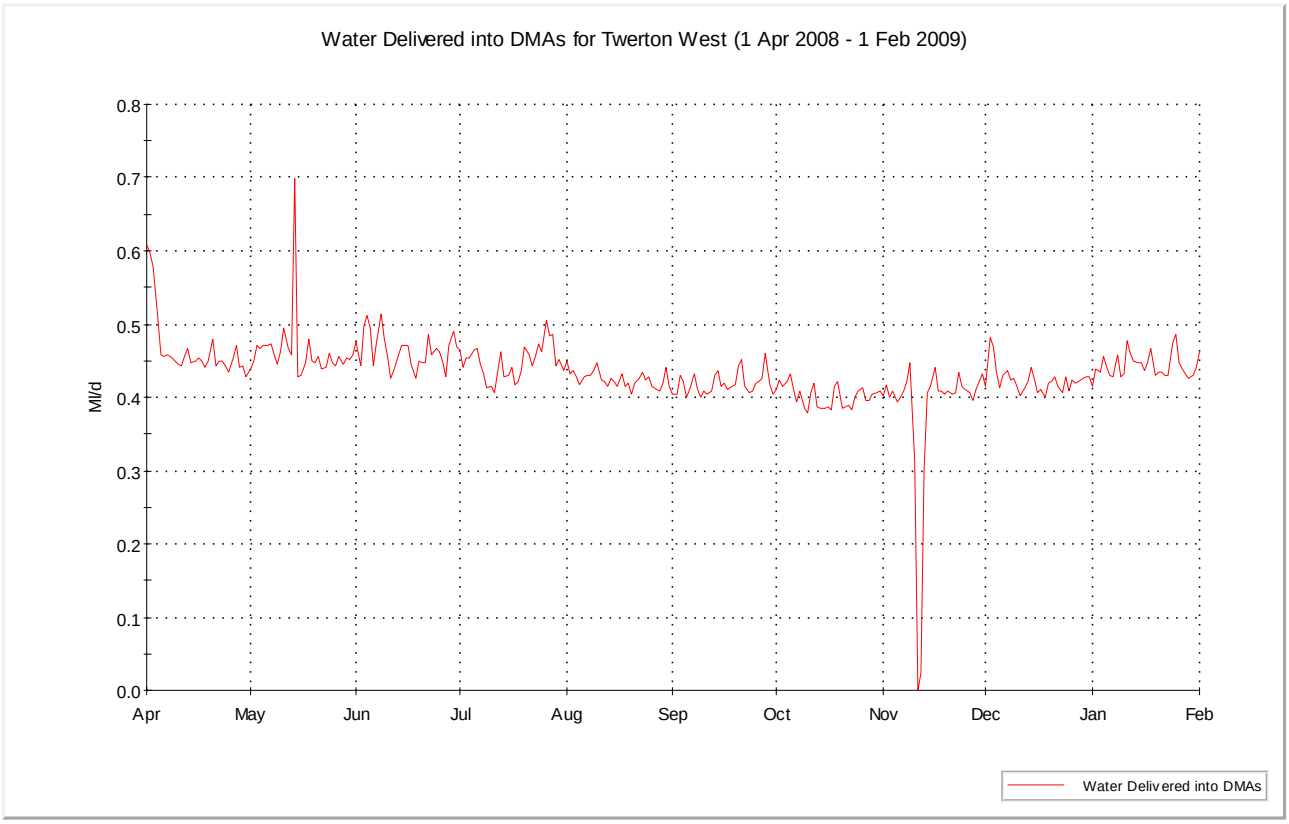
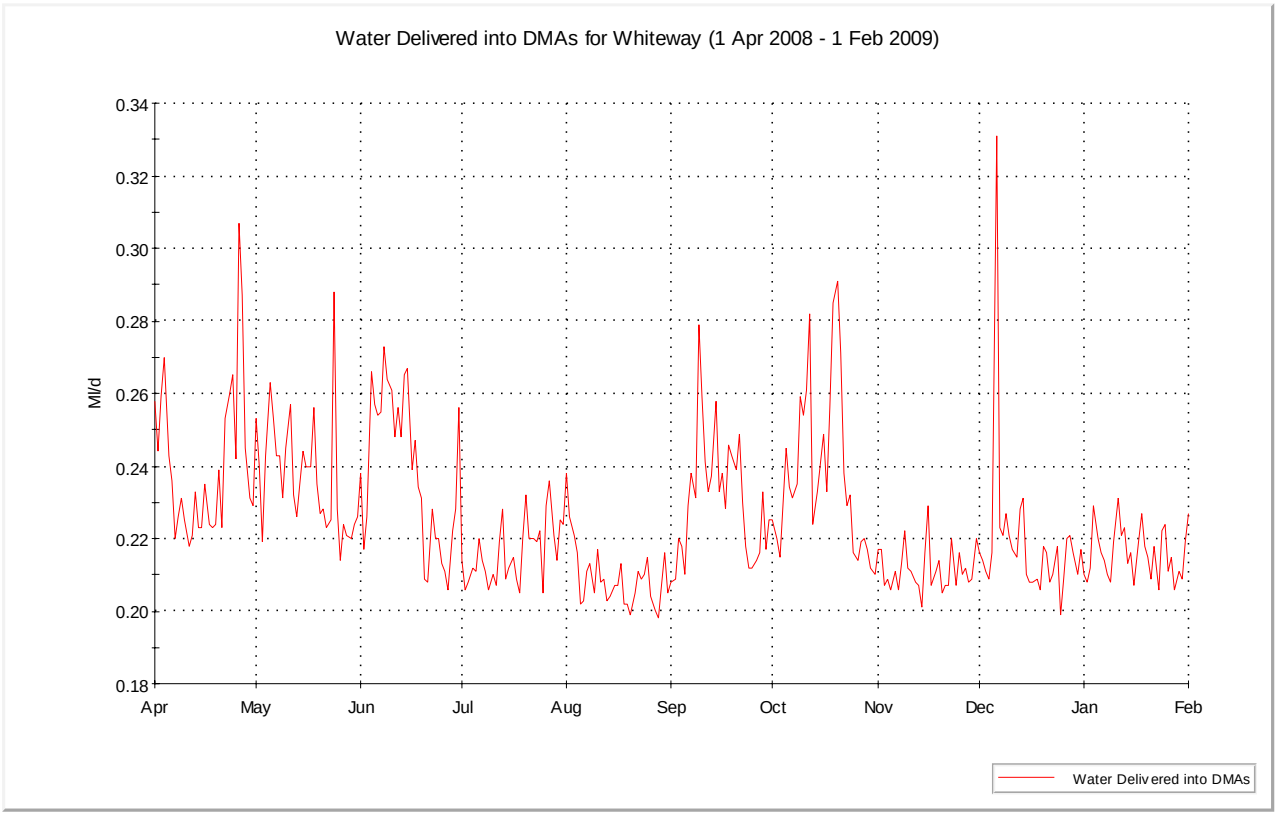
2. Periods of higher consumption

1. Periods during which the consumption didn't drop to zero for x period of time were considered to be leaks and were subtracted from the total volumes for the day.

2. Other instances are observed where the consumption remained at higher levels for a portion of the day. Unsure what this is attributed to as it doesn't happen all the time, but it raises consumption level.

APPENDIX 9: DETAILS OF GIVEAWAYS IN ENGAGEMENT BLOCKS

Intervention group	Block	Number of flats	Number of visits	Pledge cards	Magnets	Shower timers	SAF	Leaflet	Total giveaways
Device and Engagement	DE1	18	7	3	5	3		5	16
	DE2	10	5	5	5	3		4	17
	DE3	16	8	7	5	4		4	20
	DE4	16	6	6	5			5	16
	DE5	18	9	9	9	1		7	26
	TOTAL	**78**	**35**	**30**	**29**	**11**	**0**	**25**	**95**
Engagement only	E1	18	10	**9**	6	2	9	8	34
	E2	12	5	4	3	3	4	5	19
	E3	16	8	4	6	3	8	4	25
	D4	16	13	12	7	7	13	8	47
	D5	16	7	5	6	5	7	6	29
	TOTAL	**78**	**43**	**34**	**28**	**20**	**41**	**31**	**154**
	TOTALS	**156**	**78**	**64**	**57**	**31**	**41**	**56**	**249**

The table details the "giveaways" handed to residents as they participated in discussion. Pledge cards and '*Water saving in your home*' leaflets were left for all residents who were not home at the time of the visits.

APPENDIX 10: DMA DATA FOR THE TRIAL AREA