

Water system performance

Introduction

The passage of 12 months with the full contingent of 17 stage one households in residence allows us to present water use data for the 12 month period ending 30 Jun 2003.

Briefly reviewing, our expectations were that we would use about half of the total water used by a "usual" household--that is one without water saving devices. The theory is that water conserving technology makes it possible to do the same with less. We also projected that the rainwater system would make a major contribution to supplying water on site. In fact we calculated using a net daily balance methodology that we would produce on site 70% of the water that we did use. That meant that Earthsong would draw about 15% of the city water compared to the usual house. So the aim of the data gathering exercise is to verify these two targets: 50% total water use, and 15% city water use.

"Usual" use

It is important to stress here that a usual household is quite a variable statistical phenomenon. What we are interested in is the domestic water consumption of an average Waitakere City (WCC) household. The early figure we used was that provided in EcoWater (1999:2.5), Cost Benefit Analysis of New Technologies--that of 520 litres/hh/day. Since that time a number of other sources have muddied the water, the most extreme of which is EcoWater (2002:51), Asset Management Plan which gives the figure as 711 l/day. However for the purposes of this document we have used a third source, that being WCC (2002:10.2), State of Waitakere City, which gives the figure at 576 l/day ("usual use"). Interestingly that report estimates that for every litre we use in the home we use about another litre in the commercial and community sectors, but thats another story.

Data explanation

Earthsong houses are dual plumbed, potable and non-potable. The Earthsong body corp holds a single WCC water account. It buys water on behalf of the residents, and supplies this, along with tank supplied non potable water, on a submetered basis to households for potable use, and non potable use in the event that rain supplies are inadequate . It also supplies common areas on an unmetered basis.

The water the body corp sells to households therefore comprises at times both city water and tank water, both being sold at the same rate. Currently only the non-potable "tank line" is metered and this is the amount shown as 'Water sold'. The cost of supplying potable water is recovered from the surplus the body corp makes on water.

Because the overall water system has a number of separate sources and a large number of separate uses, many water meters are required. For cost reasons we have not yet been able to install all the meters we would like to, opting instead to install the minimum to reliably measure the bulk of household use.

The data

The data we have collected is the total monthly water purchased from WCC, and the non potable water sold to households, also recorded monthly. While there is insufficient data to accurately portray a comprehensive picture of total water use in Earthsong Eco-Neighbourhood the following table 1 shows the extent of the hard data.

	Water bought			Water sold		
Period	m3 bought	effective rate	\$ out	m3 billed	effective rate	\$ in
Jul-02	77	1.48	\$114	122	1.65	\$201
Aug-02	77	1.48	\$114	122	1.33	\$162
Sep-02	85	1.48	\$125	110	1.27	\$140
Oct-02	135	1.48	\$200	124	1.37	\$170
Nov-02	131	1.48	\$194	114	1.35	\$153
Dec-02	101	1.48	\$149	125	1.75	\$220
Jan-03	97	1.48	\$144	109	1.88	\$205
Feb-03	192	1.48	\$285	116	1.71	\$198
Mar-03	83	1.48	\$123	103	1.68	\$173
Apr-03	105	1.48	\$155	99	1.66	\$164
May-03	57	1.48	\$85	106	1.24	\$132
Jun-03	38	1.48	\$56	115	1.32	\$151
Total	1,178		\$1,744	1,366		\$2,070

Table 1: Recorded data for Earthsong water purchased and total non-potable water sold to 17 households.

What this data doesn't tell us is how much total water households use, nor what the rain contribution is. It tells us that we used for non-potable uses 1,366 m3 for the year or 220 litres/day/household. It also shows clearly that the total amount of water bought from the city for the year is 1,178 m3 or 190 litres per household per day. This amounts to 33% of usual use. While this is well over the 15% target figure it is still a very significant reduction in water demand.

To get a better overall picture of water use it is clear that additional water metering is required. In future we hope to get some funding to install these. In the mean time we can reconstruct an approximation of the full situation by examining clues in the dataset and making educated guesses about some water use volumes. When that is done we arrive at table 2.

	Water use							Comparisons				
	Metered (l/dd/hh)		Unmetered (l/dd/hh)		Total (l/dd/hh)			% un-metered	% ee city	usual use l/d/hh	% usual - total	% usual - city
Period	city	tank	city	tank	city	tank	total					
Jul-02	44	192	105	0	149	192	341	31%	44%	519	66%	29%
Aug-02	44	192	105	0	149	192	341	31%	44%	530	64%	28%
Sep-02	58	154	105	0	164	154	318	33%	51%	553	57%	30%
Oct-02	162	78	99	25	261	103	365	34%	72%	567	64%	46%
Nov-02	154	65	99	25	254	91	344	36%	74%	590	58%	43%
Dec-02	114	128	81	34	195	162	357	32%	55%	590	61%	33%
Jan-03	79	133	109	29	188	162	350	40%	54%	710	49%	26%
Feb-03	228	-3	144	4	372	1	373	40%	100%	676	55%	55%
Mar-03	51	148	109	25	160	174	334	40%	48%	574	58%	28%
Apr-03	112	79	91	34	203	113	316	39%	64%	530	60%	38%
May-03	31	175	80	25	111	200	311	34%	36%	530	59%	21%
Jun-03	8	214	65	40	73	253	327	32%	22%	542	60%	14%
Average	90	130	99	20	190	150	340	35%	55%	576	59%	33%

Table 2: Inferred water usage and comparison to usual usage

Eight conclusions

A number of things are worth noting about this picture.

1. Water conserving (viz a viz water supply augmentation) measures appear to be working, with total water use near expectation at 340 litres/day/household (l/d/hh) or 59% of usual use.
2. The rain collection system is capable of performing to expectations. In June only 75 litres per day per household was purchased from WCC. This amounts to 14% of usual use.
3. In practice over 12 months the system did not meet city use expectations (190 l/d/hh cf. 85l/d/hh), and possible reasons are examined below.
4. Of the 210 l/d/hh of non potable in-home use, 60% was rain supplied.
5. Of the 340l/d/hh used in total, 45% was rain supplied.
6. 35% of water is used unmetered, mostly city supplied, see below.

7. City supply varies significantly by season, between a high of 100% in February, to a low of 22% in June.
8. Earthsong total water use is fairly flat over the 12 months, more so than usual, however the summer peak in city water is sharper than usual. This is probably a product of a rural-like summer saving mindset, as well as higher summer water pricing.

Room for improvement

After reviewing the above data, we have formed conclusions as to the reasons why more water is being used, mostly city water. These along with some suitable action plans are discussed below, in order of importance.

● Avoidable direct city water uses

Over the review period a number of water uses have remained plumbed direct to the city supply unnecessarily. The existing farm house (having been utilised as a common building, as well as a common laundry) has older high water use fittings, and remains plumbed direct to the city water main. Older top loading washing machines were donated for the laundry, and until October were running on city water. A plan is underway to remove the temporary common house from the city water supply altogether.

● Garden use

Upon advice from consultants all the outdoor taps in common areas are fed from city water ostensibly for health reasons. In hindsight this now appears a mistake, given that with the close level of supervision and environmental awareness of the neighborhood's children that drinking from garden taps can easily be avoided. With some remedial plumbing we could install a tank water sourced garden tap in each cluster. However the reality is that when we most need outdoor water we have the least rain water available. Another, perhaps better, approach is the plan to install a third water supply sourced from surplus pond water for summer irrigation purposes. Pond water is one solution, as might be underground water.

● Metering

The data demonstrates that a substantial 35% of the whole complex's water is used unmetered. Given that metering creates incentives to conserve, non metered water can easily become a form of the 'tragedy of the commons' phenomenon. This clearly poses a possible area for action. Three fifths of the unmetered water is thought to be common area use, and mostly city derived. While garden water is addressed above, individual check meters for both the common house and the laundry would provide invaluable information to justify upgrading appliances and fittings located there.

- **Household potable water**

The balance of the unmetered water comprises potable use. This portion of the community's water use is hard wired to the city supply just like the outdoor taps and for the same reasons. At the time that we reluctantly agreed to council's request that we use city water for potable uses we were consoled by the fact that the literature indicated that potable water amounts to only 6-9% of domestic water use. However in hindsight what was obviously overlooked was that 6-9% of 600 litres is actually 15% of 300 litres. Having allowed 50 l/d/hh for potable use, verification of that figure is desirable.

It is clear that the performance of the tank system is restrained by the city potable requirement and at some time in the future we may want to look at that again. However we should be mindful that the rain tanks probably will not provide much additional water over and above the theoretical 240l/d/hh mark. In any event because potable appears to represent 15% of use we might look at installing meters in the future. The meters cost \$127 each, and if they reduced potable use by as much as say 5% they would pay back at about \$23 per year. Then there is the fitting cost too.

- **Tank management for non potable supply:**

Because the automatic supply change over valves are yet to be fitted, the system is reliant on our attention to manually changing between city and tank supplies. Residents have taken a while to become experienced with the system, and a few weeks can slip by with tank water available but not being used. One of the reasons for improved performance during Autumn 2003 is a tank monitor regime having been put in place. It is estimated that the non-potable rain contribution can be increased anywhere between 10-30%.

- **Aerial spraying**

Aerial spraying of Waitakere since Spring 2002 has caused a series of problems, one of which was avoiding water tank contamination with the dubious Foray 48B pesticide (submission). The strategy adopted was to remove the caps from the tank inlets for two "good rains" after each monthly spray application. It is not a simple exercise to estimate the water lost, but its likely to be in the range of 15-25%. We trust that this issue is a one-off and can shortly be relegated to the history books .

- **Construction related outdoor use**

Another possible reason for high city water use is the post construction surge in water used for making concrete, keeping concrete paths wet, and new landscape plantings. It is not possible to estimate how much water of this nature was used, and only time will tell.

The bottom line...

I guess the whole exercise has been interesting, but at the end of the day what did we save by doing it? The short answer is \$3570. Compared to the average house, each Earthsong house saved \$210 over the year.

Assuming next year we were able to get closer to the target city usage of 85 l/d/hh then this saving will increase to \$4505.

Was it worth it? Four and a half thousand dollars may not be that big a deal now, but it is easy to see that water is currently under-priced, and we will definitely be asking this question again in another five years.

In any event the system cost will pay back this side of the end of the decade and that is of course important... that and the feeling that we are doing something worthwhile.

Water Use Comparison chart

