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ET Controller Savings Through the Second Post-Retrofit Year: A Brief Update

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Introduction

Savings achieved during the 1st post-retrofit year were evaluated and documented in a separate report (*Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study*). In these previous analyses, two years of pre-retrofit billing histories were used to establish the consumption baseline, while statistical models were used to estimate savings "controlling for" weather differences between the pre- and post-retrofit years. This memorandum extends these savings estimates through the 2nd post-retrofit year. In other words, previous analyses were based on a total of three years of data while the latest are based upon a total of four. The statistical methodology used for weather correction is the same as before. Therefore, interested readers should consult the first year report if they wish to familiarize themselves with these details.

Sample

The 1st year evaluation was based upon 33 homes retrofitted with ET controllers, 56 homes that received postcards, and 155 homes subject to neither intervention (comparison group). These single-family homes were selected from Westpark's top 20% water-consuming customers, and met the additional important criterion of not experiencing resident turnover either during the two pre-retrofit years or the 1st post-retrofit year. Some of these homes, however, did experience resident turnover during the 2nd post-retrofit year, although fortunately not among the ET controller group. I thought it best to remove such homes from the present analyses to maintain an apples-to-apples comparison over time. Therefore, savings analyses through the 2nd year are based upon a subset of the original sample that includes 33 homes retrofitted with ET controllers, 42 homes that received postcards during the 1st post-retrofit year (but *not the second* since this intervention was discontinued), and 137 comparison homes not subject to either intervention (Table 1).

Table 1 Number of homes used in earlier and present analyses

	Earlier analyses (includes only 1st post-retrofit year)	Present analyses (includes 1st and 2nd post-retrofit years)
ET controller group	33	33
Postcard group	56	42
Comparison group	155	137
Total	244	212

Water Savings

The primary aim of the 2nd year follow-on evaluation is to prove that ET controllers can save water over the longer run. For the postcard group, most would expect savings to decline during the 2nd post-retrofit year since they did not receive any postcard reminders during this time period. The comparison group's consumption should remain steady to signal the absence of larger confounding factors.

As the detailed 1st year evaluation report emphasized, and I do so again, savings obtained from the ET controller group should not be generalized simplistically to other single-family homes in

Irvine. Ample empirical evidence was presented to demonstrate that the ET controller group's conservation potential prior to the retrofits was somewhat less than other homes falling among Westpark's top 20% water consumers. How to generalize savings estimates to other single-family households is described in greater detail in the 1st year evaluation report. The evidence presented here only speaks to the question, did savings decline during the 2nd post-retrofit year relative to the 1st?

Relative to the baseline, Table 2 presents the percentage reduction in consumption during the 1st and 2nd retrofit years corrected for weather differences. These are based upon the model shown in Appendix A. Since the composition and size of the ET controller group is identical to what it was during the earlier analyses, it is no surprise that estimated savings during the 1st post-retrofit year remain unchanged (approximately 7%). During the 2nd post-retrofit year, water savings rose marginally to approximately 8% of total household consumption. While both these savings estimates are individually significant, the one percentage point difference between them is not. Thus, it is more appropriate to say that ET controllers reduced total household consumption by roughly 7.7% across both post-retrofit years, on average, with no evidence of a savings decline over time.

Table 2 Percentage reduction in total household consumption

	During 1st post-retrofit year	During 2nd post-retrofit year	During 1st and 2nd post-retrofit years combined
ET controller group	7.2%	8.2%	7.7%
Postcard group	3.9%	≅0.0%	--✞
Comparison group	≅0.0%	≅0.0%	≅0.0%

✞Omitted since the postcard intervention was discontinued during the second post-retrofit year.

A 7.7% reduction in total household consumption translates into a saving of roughly 41 gallons per household per day for the retrofitted homes. What proportion of outdoor use do these savings represent? Only an approximate answer can be provided to this question since irrigation is not separately metered. Earlier I had derived an approximate estimate of outdoor consumption as the positive difference between total consumption and IRWD's indoor allocation. This methodology indicates that outdoor use is roughly 43% of total use among the retrofitted homes. Therefore, expressing savings as a percentage of only outdoor use, not total, suggests that ET controllers reduced outdoor use by roughly 18% (0.077÷0.43) over the two year post-retrofit period.

Savings analyses for the postcard group suggests that water consumption relative to the baseline declined by roughly 4% during the 1st retrofit year, but that once the postcard mailings stopped, the savings also vanished—estimated 2nd year savings are statistically indistinguishable from zero. In other words, the postcard intervention did not have any lingering effect during the 2nd post-retrofit year, a finding well within the realm of expectation. Note that 1st year savings for

the postcard group reported here do not match what was reported earlier because the sample composition is no longer the same: fourteen postcard homes (56 minus 42) were excluded due to resident turnover. The earlier higher estimate of postcard effectiveness was driven by a few homes that were heavy water wasters prior to the beginning of this study.

The comparison group's water consumption—which could have changed over time because of confounding factors operating in the broader service area—remained steady during the analysis period, suggesting the absence of such factors. This finding considerably bolsters our confidence in the derived water savings estimates. Comparison group indicators are excluded from the final model (Appendix A) because they are statistically insignificant.

Dollar Savings

IRWD's inclining rate structure complicates conversion of gallon savings into dollar savings. Customer bills are a function of both the indoor and outdoor allocations, as well consumption relative to these allocations. Previously, I estimated dollar savings as follows: first, I weather normalized the billing histories; then I computed customer bills taking into account information about the customer-specific allocations and of course the rate structure; finally I differenced the pre- and post-retrofit average bill to estimate dollar savings to the customer. This exercise was repeated for the 33 ET controller homes, now taking both the 1st and 2nd post-retrofit year into account. Among these homes, average and median dollar savings work out to $30 and $23 per household per year, respectively. But I believe a well-targeted program in IRWD's service area will likely save participating customers significantly greater monies, on average, compared to the experience of these 33 retrofitted homes.

Conclusion

Estimates of retrofit-related savings through the 2nd post-retrofit year indicate no diminution over time. If anything, savings seem to have marginally risen, although the measured nominal rise is well within the expected range of statistical variation. Through the end of the 2nd post-retrofit year, ET controllers had reduced total household use by approximately 7.7%, or outdoor use by 18%. These findings can only bolster our confidence in the efficacy of ET controllers.

Two caveats should be borne in mind. First, as noted above, estimated savings must be extrapolated to other populations with care—the 1st year evaluation report provides a detailed discussion of these issues, which remain as relevant now as before. Second, although customer feedback through the end of the 1st post-retrofit year did not indicate any noticeable dissatisfaction with ET controllers, these issues were not reexamined through the end of the 2nd post-retrofit year because this task fell beyond the scope of the follow-on evaluation.

Appendix A Fixed Effects Water Savings Model
Independent Variable: Ln(total consumption per day in HCFs)

Covariate	Coefficient	Std. Error	t-statistic
Intercept	0.0087	0.0389	0.22
February indicator	-0.1927	0.0255	-7.55
March indicator	-0.0766	0.0197	-3.89
April indicator	0.0786	0.0199	3.95
May indicator	0.2159	0.0193	11.16
June indicator	0.3325	0.0200	16.59
July indicator	0.3761	0.0199	18.91
August indicator	0.3753	0.0203	18.53
September indicator	0.3422	0.0200	17.15
October indicator	0.2213	0.0209	10.58
November indicator	0.1264	0.0215	5.89
December indicator	-0.1390	0.0271	-5.14
January weather deviation	8.8544	1.3007	6.81
February weather deviation	8.9467	0.9830	9.10
March weather deviation	7.0127	0.7709	9.10
April weather deviation	5.0432	0.6797	7.42
May weather deviation	3.2142	0.4539	7.08
June weather deviation	1.8373	0.7711	2.38
July through October weather deviation	1.9275	0.2932	6.57
November weather deviation	6.8198	1.7918	3.81
December weather deviation	7.9704	1.1270	7.07
ET controller group, 1st post-retrofit year indicator	-0.0753	0.0154	-4.90
ET controller group, 2nd post-retrofit year indicator	-0.0860	0.0155	-5.56
Postcard group, 1st post-retrofit year indicator	-0.0390	0.0137	-2.86
Postcard group, 2nd post-retrofit year indicator	-0.0136	0.0138	-0.99
Adj. R square	52.9%		