Limitations of the Pacific Institute Testimony and Report

Rebuttal Testimony Before the California State Water Resources Control Board
In the Matter of the U.S. Bureau of Reclamation Water Rights Permits
(Cachuma Project)
Phase 2 – November, 2003

Misty Gonzales, Water Conservation Specialist
Goleta Water District

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1.0 Summary of Analysis

Many of the assumptions underlying the draft Pacific Institute report[1] ("Pacific Institute Report") are unsuitable for reliable water supply planning by the Member Units.[2] The Pacific Institute's testimony and the report on which it is based contain several significant factual and methodological errors. These errors highlight the difficulty of constructing a model that will accurately predict water conservation savings. Because of these errors and limitations, the Pacific Institute's estimates of potential water savings are overestimated.

2.0 The Pacific Institute's Testimony and Report Does Not Account for Reliability Requirements for Water Supply Planning by the Member Units

2.1 The Pacific Institute Overstates Absolute and Relative Consumption Levels by the Member Units

Producing meaningful per capita water consumption figures is a complex, if not impossible task, and the Pacific Institute struggled with this as well. Because of the inherent difficulties in comparing per capita figures across different water agency service areas with varying mixes of residential, commercial, and industrial use, per capita analyses are not generally the most reliable measure of achieved water conservation reductions. Measured end use information before and after the conservation retrofit is much more precise.

Given the inaccuracies posed by per capita analysis, it is difficult to analyze the Pacific Institute results. The Pacific Institute reports "gallons per capita per day" (gpcd) consumption levels by the Member Units to be between 82 gpcd and 231 gpcd. ID No. 1 is reported as the highest, but more than one-half of their gpcd number is delivery of water for agriculture.[3] Their gpcd number is likely closer to 110. Montecito, which is listed at 201 gpcd, has a high number because of the size of its properties needing landscape irrigation.

The Pacific Institute estimates that if the most efficient currently available technologies were installed, average residential use could be as low as 65 gpcd, 35 gpcd of which is used indoors. According to a study completed by the American Water Works Research Foundation in 1999, a household fully retrofitted with available water conservation equipment can reduce indoor per capita use to 49.6 gpcd. Lowering the figure to 35 gpcd will require additional conservation measures that could be legitimately classified as "potential best management practices", beyond the scope of the current list

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[1] CalTrout Exhibit No. 63.

[2] The Pacific Institute Report has also not yet been peer-reviewed.

[3] The same is true for Carpinteria (about 50%) and Goleta (about 17.5%). Footnote 6 of Table 1 indicates that agricultural water use was excluded from the per capita consumption figures. Footnotes 7 through 11, however, indicate that the water use numbers for each agency were taken from each agency's Urban Water Management Plan. Pursuant to Water Code section 10631(e)(1)(I), each of the Urban Water Management Plans referenced quantifies, to the extent records are available, past and current water use over five-year increments identifying water uses among water use sectors, including the agricultural sector.

of 14 BMPs. In addition, at the peak of past water conservation efforts during the last drought, the City of Santa Barbara was only able to reduce per capita consumption to 71 gpcd, at a time when irrigating outdoor turf was prohibited.

Urban Water Production data from DWR's Bulletin 160-98, the California Water Plan Update, Appendix 4C (1998)[4] shows urban water production in Santa Barbara County at about 150 gpcd compared to a statewide average of 200 gpcd. In a presentation by Dana Haasz, Rethinking Urban Water Use, 1995 per capita consumption in California ranged from 132 gpcd to 349 gpcd.[5] Under this standard, even the highest per capita consumption among the member units is only in the middle of the consumption range and the weighted average is near the bottom of the range.[6] This is significant, as water agencies with lower gpcd figures before implementation of conservation programs will have less "room" to achieve a reduction in demand. Thus, the "achievable" water conservation savings for the Cachuma agencies will appear lower than that of higher gpcd agencies.

The Pacific Institute's per capita consumption figures also do not properly account for the significantly different character of the Member Unit service areas. Montecito has customers with large properties. This unique characteristic significantly skews per capita water consumption analysis. This consumption effect is acknowledged in the DWR report, Measuring The Price Responsiveness Of Residential Water Demand In California's Urban Areas (1998) ("DWR Elasticity Report).[7] In that report, the estimated coefficient on the lot size variable, a proxy for landscaped area, is positive and statistically significant. The larger the property, the greater the demand for water. The magnitude of the estimated coefficient implies a 10 percent increase in lot size square footage will result in a 2.7 percent increase in water demand on average, all other factors held constant.[8] Almost all of the customers within the Montecito service areas have properties of at least one acre, 400% larger than a typical urban lot size in Santa Barbara, Goleta or Carpinteria. Some customers have even larger properties.

In addition, the Pacific Institute claims, in footnote 6 of Table 1 of their testimony, to include CII water use in their analysis.[9] However, including this water use skews per capita water use for all of the Member Units in Santa Barbara and Goleta in particular as they have a larger amount of CII customer use. Goleta serves the University of California at Santa Barbara. Santa Barbara hosts a significant number of tourists, which accounts for a portion of their water supply attributed to per capita use. Finally, the Pacific Institute appears not to account in their methodology for the extensive use of

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[4] http://rubicon.water.ca.gov/pdfs/v1/v1ap4c.pdf

[5] http://www.watersave.uk.net/Presentations/Dana--Haasz.ppt

[6] By multiplying Santa Barbara's gpcd of 150 under Bulletin 160-98 by the ratio of weighted consumption to Santa Barbara's consumption only under the Urban water needs analysis (102/85), the product is 180 gpcd.

[7] http://rubicon.water.ca.gov/pedreport.pdf.

[8] Id. at page 16.

[9] CalTrout Exhibit No. 50, p. 2.

recycled water by both Goleta and Santa Barbara.[10] Although recycled water is not potable, it does displace potable water supplies previously used for irrigation, thus decreasing the demand for potable water.[11]

2.2 The Pacific Institute's Analysis of Potential Urban Outdoor Water Conservation Savings Is Overly Ambitious

2.2.1. The Pacific Institute Does Not Acknowledge Significant Conservation Savings Already Achieved in Urban Landscaping

The Pacific Institute claims that 3,000 AFY to 4,500 AFY of water, "reductions of 25 to 40 percent", "[can] be made with improved management practices and available technology, economically and relatively quickly, even without changes in landscape design and plant type."[12] However, this water savings assumption does not factor in the extensive water conserving landscape practices, which account, to a significant degree, for the Member Units' relatively low per capita residential water consumption. As testified to previously, several programs have been developed and put in place to promote water efficient landscaping throughout the Member Units' service areas.[13] Each of these programs promotes most of the Pacific Institute's urban residential landscape water conservation recommendations and, collectively, the programs promote all of the recommendations. In fact, the Santa Barbara Region has been a leader in the concept of "appropriate landscape design" and use of low-water-using plant material and drip irrigation. Thus, the expectation of full water conservation savings in the landscape sector is likely not realistic because these activities have already been underway for a number of years.

2.2.2. The Member Units Are Already Installing ET Controllers to Further Their Development

ET controllers have a significant degree of water conservation potential. To help meet that potential, the Member Units have received funding to implement an ET controller program in their service areas.[14] However, the potential savings or cost-effectiveness of weather based irrigation controllers have not yet been systematically quantified in a statistically significant study. Such a study will be undertaken as part of a Proposition 13 grant award of $3.4 million for ET controllers in both northern and southern California. Studying the water savings and cost-effectiveness will be part of this pilot program grant.

It is important to emphasize that there are significant costs to implement an ET controller program of sufficient scope to achieve even a portion of the potential water

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[10] Although the Pacific Institute report, at pages 25 and 40 does promote recycled water as a potentially significant source of new water supply for California's urban water sector and "an important part of smart water policy for California."

[11] A possibility also acknowledged by the Pacific Institute Report at page 40.

[12] CalTrout Exhibit No. 50, p. 3, Table 2 and pp. 8-9.

[13] CCRB/ID#1, Exhibit 209, pp. 13-16.

[14] CCRB/ID#1, Exhibit 209, pp. 13-14.

savings that have been estimated by the Pacific Institute Report for the Member Units based on the WeatherTRAK® controller. There are currently 280,000 people in the Member Units' service area.[15] At a reported County census density of 2.79 persons per household for both single family and multi-family, it would be reasonable to assume 100,000 households among the member units. Half of these households, or 50,000 households, have irrigation controllers already.[16] Accordingly, to achieve the maximum water savings for ET controllers assumed by the Pacific Institute (about 1,400 AFY[17]), 30,000 to 40,000 households would need to be retrofitted at a capital cost of more than $500 each.[18] The total capital cost alone would exceed $15 million, not including the annual signal fees of about $50 per year per household, or an additional $1.5 million per year.[19] There would also be additional operational expenditures for a homeowner education programs. In addition, implementation of the ET controller program in the County of Santa Barbara is requiring more staff time than originally anticipated, thus increasing the original estimated costs for this program[20], and decreasing its cost effectiveness.

2.2.3. Behavioral Changes Are Difficult to Estimate Dependably for Water Supply Planning Purposes

It is clear that implementing landscape water conservation measures reduces consumption. However, the amount of savings achievable has not been quantified sufficiently for reliable water supply planning, although research efforts are underway to do so. The Pacific Institute's estimate that a 25% to 40% reduction in urban residential landscape water use is attainable has been verified by preliminary study findings from sophisticated landscape conservation programs using ET controllers in Orange County. That study also shows that the bulk of the potential savings are only realized when there is a continuous labor-intensive homeowner education program in place. In addition, the study was conducted in a tract home neighborhood, which is not always typical in the Santa Barbara area.

The estimated potential water savings from ET Controllers is 12.5%, based on 50% penetration[21] and 25% savings.[22] The balance of potential savings must come from behavioral changes, or "improved management practices." The effects of behavioral changes have been studied under very controlled environments, but the persistency of those behavioral changes has not. Even the Pacific Institute admits that "evaluation of

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[15] The actual number is 280,000, not 207,000. See CCRB/ID#1 Exhibit 201, p. 1.
[16] CalTrout Exhibit No. 50, p.8.
[17] Because 2,800 AFY represents approximately 25% water savings from current residential landscape use, the Pacific Institute claims 25% water savings from ET Controllers based on the IRWD study, but only 50% of households can avail themselves of those savings within the Pacific Institute's cost parameters.
[18] CalTrout Exhibit No. 50, p. 13.
[19] IRWD Study, pp. 30-31; CalTrout Exhibit No. 53, p. 3.
[20] CalTrout Exhibit No. 53
[21] CalTrout Exhibit No. 50, p. 6.
[22] CalTrout Exhibit No. 53, p.1.

landscape programs is [relatively] difficult and is constrained by lack of data and consistency in homeowner behavior."[23]

2.3 The Pacific Institute's Analysis of Potential Urban Indoor Water Conservation Savings Is Overly Ambitious

2.3.1 The Methodology Used to Determine Water Savings and Associated Benefits from ULFT Retrofits Raises Questions

The Pacific Institute estimates that a 100% retrofit of existing inefficient toilets in both the residential and CII sectors would yield about 1,500 AFY of water savings. It is clear that toilet retrofits are a positive action for water conservation. That is why Goleta and Santa Barbara were a pioneers in ULFTs since long before the CUWCC MOU. However, the Pacific Institute did not use CUWCC water conservation assumptions[24] for Carpinteria, Montecito and ID No. 1 (the "three smaller districts").

The amount of potential water conservation estimated by the Pacific Institute for the three smaller districts is difficult to defend. The Pacific Institute assumes a 4.4 gallons per flush (gpf) savings from the retrofit of a 6.0 gpf toilet to a 1.6 gpf toilet and a 1.9 gpf savings from the retrofit of a 3.5 gpf toilet to a 1.6 gpf toilet.[25] A high percentage of existing toilets are already in the 3.5 gpf range. A second issue is that the REUW study clearly indicates that a "1.6 gpf" toilet is actually more than 3 times more likely to flush at 2.0 gpf or above than at 1.6 gpf.[26] Similarly, a "6.0 gpf" toilet is 7 times more likely to flush at significantly less than 6.0 gpf, often at 4.5 gpf, than it is to flush at 6.0 gpf or higher. Anecdotal evidence suggests that the reason "6.0 gpf" toilets often flush at less than 6.0 gpf is due to the number of 6.0 gpf toilet owners that install water saving displacement devices in the toilet tank. The real potential water conservation numbers indicated by the histogram in the REUW study suggest that potential water conservation from ULFT replacement for the three smaller districts, while important, may be significantly less than that projected by the Pacific Institute. Additionally, the CUWCC acknowledges that ULFTs are less efficient over time due to leakage and discounts conservation savings from toilets accordingly.

Finally, traditional cost-benefit principles for ULFTs have not been tested empirically for retrofit programs approaching 100% implementation. With no water agency in the State having approached 100% implementation, we do not have the necessary case study to evaluate. Interestingly, the Pacific Institute assumes 100% implementation for all of the Member Units except Santa Barbara. The Pacific Institute

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[23] Ibid.

[24] The CUWCC savings assumptions measure reliable savings, "i.e. [savings for which] there is a fifty percent chance that the realized savings will exceed the estimate and a fifty percent chance that the realized savings will be less than the estimate." Assumptions and Methodology for Determining Estimates of Reliable Water Savings From the Installation of ULF Toilets, CUWCC, 1992, Section II. The Pacific Institute appears to be attempting to measure maximum potential savings. Using a "reliable" water savings projection may lower the estimated amount of savings.

[25] CalTrout Exhibit No. 63, p.48.

[26] CalTrout Exhibit No. 66, p. 97, figure 5.10.

lists Santa Barbara as having 50% ULFT penetration.[27] Based on that statistic, the Pacific Institute concludes that "there is probably only a negligible amount to be saved through accelerating replacement" in Santa Barbara,[28] while assuming that the conservation potential and cost-benefit ratio is favorable for the other Member Units up to 100% penetration. The Pacific Institute also does not take into effect that the costs to retrofit each additional percent of toilets increases exponentially near 100% saturation.

2.3.2 The Methodology Used to Determine Water Savings and Associated Benefits from Clothes Washer Retrofits Also Raises Questions

The Pacific Institute incorporates an unorthodox measure of "water efficiency" in its testimony. The industry practice is to measure the efficiency of washers by a water factor: the number of gallons per cycle per cubic foot.[29] The Pacific Institute, however, uses the arbitrary measure of gallons per load. Gallons per load is not a useful proxy for water efficiency because load size is an important factor for determining water efficiency – this is why the water factor controls for the number of cubic feet in a washing machine cycle.[30]

The Pacific Institute also tries to present some of its own data on the price differential between types of washers, but its data are outdated. The Pacific Institute lists 11 "more efficient" models. However, according to CEE,[31] only 4 of these washers are still on the market, even if one accounts for model upgrades. Of these, the lowest priced model[32] has a water factor of 11.0, the highest water factor still considered "efficient." Most efficient washers have a water factor of 9.5, and some have a lower water factor. The successor to the most expensive "low-efficiency" washer listed by the Pacific Institute actually has a water factor of 8.5.[33]

The Pacific Institute's Report maintains that water-efficient washers can be purchased for only $90 more than comparable, but less water-efficient washers. This is not supported by current market experience. The cost differential is currently between $200 to $800 per washer, even presuming the continuation of the existing water and energy utility rebates. Thus, the customer's reluctance to spend the additional funds –

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[27] CalTrout Exhibit No. 50, pp. 5-6.

[28] CalTrout Exhibit No. 50, p. 6. The actual rate of penetration may be closer to 35%.

[29] CalTrout Exhibit No. 62, p.2: "Current Issues"; Water Factor is also the measurement standard used by the Consortium for Energy Efficiency (CEE) Commercial Clothes Washer Initiative, referred to by the Pacific Institute at CalTrout Exhibit No. 63, p. 56 (http://www.cee1.org/com/cwsh/cwshspec.pdf and http://www.cee1.org/resid/seha/rwsh/rwsh-prod.pdf). The Pacific Institute refers to Water Factor at pp. 57-58 of CalTrout Exhibit No. 63, but then does not use it.

[30] Other factors may also contribute to the water-efficiency of a washing machine. Some higher-cost "less efficient" washing machines have variable water level settings and even determine the dirtiness of rinsewater, stopping the rinse cycle early when the clothes are actually clean. Some lower-cost "high efficiency" clothes washers do not have these features.

[31] http://www.cee1.org/resid/seha/rwsh/rwsh-prod.pdf

[32] The Whirlpool Resource Saver

[33] The Fisher & Paykel model. CalTrout Exhibit No. 63, p. 128; http://www.cee1.org/resid/seha/rwsh/rwsh-prod.pdf.

even though the entire amount would be recouped during the life of the more efficient machine – needs to be examined.

As further evidence of the cost differential, The REUW Study[34] states: "these clothes washers had been prohibitively expensive for the American consumer with machines ranging in price from $800 to $1,200 (substantially higher than the more standard vertical axis top-loading washing machines)." While the REUW study makes this statement in the past tense, it unfortunately continues to be true. REUW's statement is also consistent with ENERGY STAR criteria.[35] ENERGY STAR describes the current state of the water-efficient washer market as follows: "Approximate price range for ENERGY STAR qualified clothes washers: $650 - $1397. Approximate price range for non-qualifying clothes washers: $200 - $893." Accordingly, a higher-efficiency washer with few features may cost only a small amount more than a less-efficient washer with all features. However, the difference in price between like washers is $450 to $550.

The California Energy Commission has already adopted a water factor standard of 9.5 for all commercial clothes washers. The Commission has proposed in a formal rulemaking an 8.5 water factor for all residential clothes washers as of 2007, and 6.0 as of 2010. By automatically requiring the marketplace to become more efficient, the need for water agency rebate programs will diminish over time. It will no longer be cost effective for water agencies to incentivize early replacement. Indeed, the CUWCC is in the process of revising its BMP on clothes washer retrofit to reflect this new development.

3.0 The Use of the 1951 Critical Dry Year for Water Supply Planning Is Reasonable and Prudent

The Pacific Institute Report criticizes the use of the 1951 critical dry year for water supply planning purposes. They maintain that "using this scenario to drive the planning process is not reasonable."[36] However, it would also be imprudent from a political and water supply standpoint not to plan using a 1951 critical dry year. As recently as February of 1991, the Member Units faced a "1951" critical dry year. It was only through the event known as the "March Miracle" that the Member Units did not endure another "1951" critical drought year. Water supply planners, of course, tend to plan within contextual horizons of greater than 15 years. However, even voters cannot be expected to simply forget that the 1991 water shortages ever happened, even if they may have forgotten about the water shortages in 1951.

4.0 The Pacific Institute Misapplies the Data From the Studies it Cites in Stating Its Conclusions

The Pacific Institute acknowledges that "lack of good data has greatly hindered progress in both capturing and measuring efficiency improvements in the residential

[34] CalTrout Exhibit No. 66, p. 157.
[35] CalTrout Exhibit No. 62, p.2: "Market Characteristics"
[36] CalTrout Exhibit No. 50, p. 15.

landscape sector."[37] This statement is partially true – the data that exists is typically good. However, there is not enough data to support the Pacific Institute's claims for potential urban residential landscape water conservation. Moreover, the small amount of data to which the Pacific Institute does cite is misapplied. The Pacific Institute extrapolates conclusions from the data which the data does not support.

The Pacific Institute's reference to CalTrout Exhibit No. 63 refers to a table which contains potential conservation savings for several actions, but the basis for the potential conservation savings is not established in CalTrout Exhibit No. 63 itself.[38] Rather, the table refers to other studies. Copies of these studies are not introduced as exhibits. Many of the studies are unavailable, even at the internet link cited by the Pacific Institute.[39]

The other studies do not support the broad conclusions stated by the Pacific Institute. The WUCOL report[40] is widely used in the conservation community. However, among the limitations admitted by the report is the fact that "it is subjective"[41] because it is based, not on quantitative analysis, but, on experiential estimates by the study participants.[42] The fact that the report is admittedly subjective should be considered in weighing it as part of the evidence.

The Pacific Institute uses an outdated copy of the Pittenger report. Pittenger published an updated version of his report in the June 2001 issue of the Journal of Environmental Horticulture.[43] The Pacific Institute represents that the Pittenger study focused on proper irrigation and soil maintenance. Rather, both Pittenger studies focused on the comparative ETo of groundcover compared to turfgrasses.[44] Moreover, according to the Pittenger report "generalizing effective irrigation scheduling" was only a secondary objective of the report and analyzing the effect of soil maintenance was not a subject of the study at all.[45]

The 1997 report by Western Policy Research cited by the Pacific Institute is also of limited applicability. The full title of the report is "Efficient Turfgrass Management: Findings From the Irvine Spectrum Water Conservation Study" (Spectrum Report). The Spectrum Report analyzed the effects of behavioral changes in the management of

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[37] CalTrout Exhibit No. 50, p. 71.
[38] CalTrout Exhibit No. 63, p. 76.
[39] These are the studies by Moller, Steirer and Broder, and Lessick.
[40] CalTrout Exhibit No. 63, p. 75, fn. 25.
[41] WUCOL Report, p. 61.
[42] "Water needs categories assigned for each species were determined by consensus of [a] committee." WUCOL Report, p. 52.
[43] J. Environ. Hort. 19(2):78-84. June 2001.
[44] This type of groundcover accounts for only 25% of irrigated landscapes in the greater Los Angeles Basin. Extrapolating potential water savings from better management of this type of plant to the achievement of overall savings for urban residential landscape water consumption would be inappropriate, given the assumption by the Pacific Institute that there will be no change in the mix of plant palettes.
[45] "The principle objective of this study was to determine the minimum amount of irrigation required to maintain established, commonly used groundcover species in aesthetically acceptable condition. Documenting any significant changes in root systems and generalizing effective irrigation scheduling were secondary objectives." Pittenger (1992), p. 1.

commercial landscape irrigation by one contractor for one customer.[46] It is true that one motivated customer can make a significant difference in water conservation. A good example of this is the University of California at Santa Barbara, a customer of the Goleta Water District. By using 100% recycled water for landscape irrigation, UCSB has had a significant positive impact on Goleta's water supply. However, it is unreasonable to extrapolate the water savings achieved by one customer to calculate the potential water savings achievable by an entire water agency with thousands of unique customers. Moreover, the study concluded that about 60% of the estimated savings calculated in the study were attributable to inclining rates and outreach programs, while the Pacific Institute attributes 100% of savings to scheduling, maintenance and practices.[47]

The SPUC study(ies)[48] cited are also of limited use. The study reports the output of a sophisticated model developed by the Seattle Public Utility. However, the model is generally unavailable to the public.[49] Without being able to analyze the model, the report conclusions are of limited value. This is especially the case given the liberties that the Pacific Institute has taken with the data from the other reports. Even so, under the most optimistic scenario in the SPUC report, savings from outdoor behavior are only about one-fourth of savings from irrigation scheduling, which the Pacific Institute projects at about 25%.[50] This potential conservation amount of about 6% conflicts with the Pacific Institute's estimates of 10% to 20% based on the SPUC report(s).[51]

The Pacific Institute references a study by the Irvine Ranch Water District (IRWD Study).[52] However, they fail to acknowledge that the IRWD study had a sample size of only 40 households.[53] In addition, the ET controller cost estimate was orders of magnitude lower in the IRWD study than in the Pacific Institute's testimony.[54] Nevertheless, IRWD found its ET Controller program not to be cost-effective at the household level.[55]

5.0 Conclusion

The limitations of the Pacific Institute testimony and report make each unsuitable for reliable water supply planning by the Member Units. The Pacific Institute does not

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[46] Spectrum Report, p. 4.
[47] Spectrum Report, p. 27. CalTrout Exhibit No. 63, p. 75.
[48] Seattle Public Utilities only links to a 1998 report and there is no mention of a 1999 report. This testimony will hereafter refer only to the 1998 report.
[49] Al Dietemann, Water Conservation Lead, personal correspondence.
[50] SPUC (1998), Final Project Report, p. 5; CalTrout Exhibit No. 63, p. 76.
[51] CalTrout Exhibit No. 63, p. 76.
[52] CalTrout Exhibit No. 63, p. 76; Because the Pacific Institute does not factor in the cost of installing a controller where none exists, and because it does reference the percentage of homes with controllers, it seems reasonable to believe that the Institute assumes that only households currently with controllers will be retrofitted.
[53] IRWD Study, p. 4. A similar study of soil moisture probes cited by the Pacific Institute (the Allen report, CalTrout Exhibit No. 63, p. 75), similarly had only 37 participants.
[54] $175 in capital costs for the IRWD Study (p. 30) vs. $562 in capital costs in the Pacific Institute testimony, CalTrout Exhibit No. 50 (p. 13)
[55] IRWD Study, p. 31.

properly tailor its per capita water consumption analysis for the unique characteristics of the Member Units. Some of the assumptions and data used by the Pacific Institute are either unorthodox or outdated. Much of the data which is cited is miscited. As explained by Mary Ann Dickinson, policy reasons favor continued reliance on the CUWCC MOU rather than the Pacific Institute recommendations. The significant limitations of the Pacific Institute report make such continued reliance even more important.