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From the Editor

A goal of *Texas Water Savers* has been to heighten the awareness about water conservation and reuse activities occurring in Texas. We feel that enthusiasm about water conservation and reuse seems to be increasing and can be shown in many ways. At April's Texas Section meeting of the American Water Works Association (AWWA) meetings in Corpus Christi, a session was devoted to water conservation and reuse. Many articles in this newsletter deal with news from that meeting.

Another way to gauge the increased interest in water conservation is by looking at the groups that have recently announced they will take part as *Texas Water Savers* sponsors. New sponsors are:

- The City of Houston, which is involved in many conservation efforts including education, retrofit programs and water audits
- Resource and Planning Consultants, Inc. of Austin. John Specht and his staff specialize in urban water conservation projects
- The Harris Galveston Coastal Subsidence District, which sponsors educational programs and supports many water conservation programs
- Freese and Nicholls Engineers, Inc., of Fort Worth, who design and implement water conservation programs.

These new sponsors join our existing family of sponsors and members. Other sponsors include the Texas Water Development Board, the Lower Colorado River Authority, the Texas Association of Water Board Directors, the San Antonio Water System, Alan Plummer and Associates, Inc., of Arlington, and Susan Rust of Stewardship Services, Inc., of San Antonio.

We are very grateful to these sponsors for their support. We need sponsors, who make financial contributions to help defray printing and mailing costs for this newsletter, so that we can continue publishing *Texas Water Savers*. Our goal is to raise enough money each year to publish this newsletter. We urge any business or organization with an interest in water conservation to contact us personally at the Texas Water Resources Institute to become a sponsor. Our phone number is (409) 845-1851.

Sincerely,
Ric Jensen
Editor, *Texas Water Savers*

Water Reuse and Conservation Discussed at AWWA Corpus Christi Meetings

Water conservation and reuse efforts throughout Texas were discussed at the April meeting of the Texas Section of the American Water Works Association (AWWA). The meetings, which were in Corpus Christi April 10-12, featured two technical sessions that focused on water conservation and reuse. The presentations were organized by the Water Conservation and Reuse Committee of the Texas Section of AWWA. Future Texas Section meetings of AWWA will likely also include sessions dealing with these topics.

Roughly 50 participants took part in these sessions. Individual presentations focused on: incentives for conservation and reuse in San Antonio, teaching public school students in the Houston-Galveston area about the importance of conservation, Corpus Christi's xeriscape program, Austin's free low-flush toilet program for low income customers, customer initiatives to increase conservation in Houston and Cedar Park, the potential for use and reuse of brackish groundwater, an assessment of the effectiveness of water conservation programs in El Paso, and work by the Texas Water Resources Institute to set up a world wide web site that allows computer users to gain access to *Texas Water Savers* and other water conservation information. Summaries of many of these presentations will be featured in this and upcoming issues of *Texas Water Savers*.

For more information on conservation activities within the Texas Section of AWWA, contact Tony Gregg of the City of Austin at (512) 499-3557.

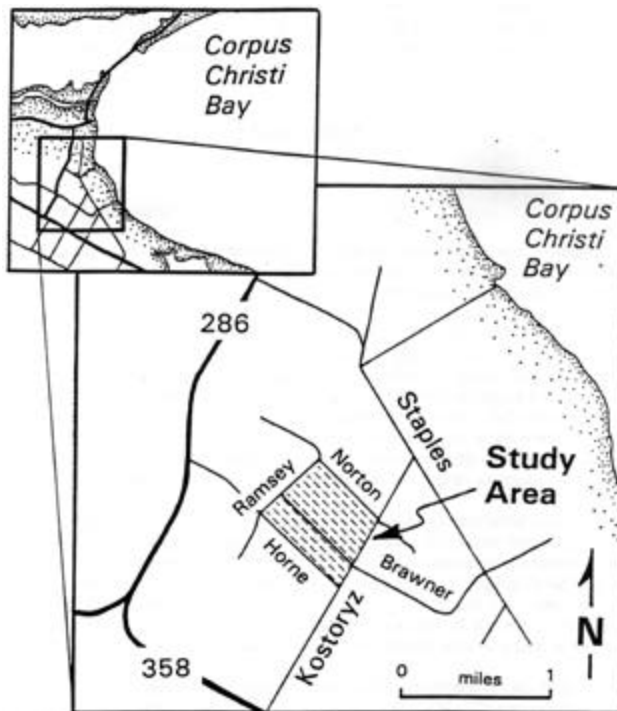
Corpus Christi Home Retrofits Show Savings

A pilot study of voluntary plumbing retrofits in Corpus Christi, "Retrofit Study in Single-Family Households, Corpus Christi, Texas," was conducted late in 1993 for the Corpus Christi Department of Public Utilities by Jennifer Prouty of the Center for Water Supply Studies at Texas A&M University-Corpus Christi, and Richard Gonzales H. of New America Marketing in Corpus Christi.

Study results, which were presented by Prouty at the Water For Texas Conference in January in Austin, show that: 1) retrofitted households saved an average of 13% of household's historical water use, 9.3 gallons per person per day (3,394 gallons per person per year), 29 gallons per household per day (10,523 gallons per household per year), and between about \$12 and \$51 per year in water and wastewater charges; 2) the 195 retrofitted households together provided the City of Corpus Christi additional wastewater treatment capacity of 168,480 gallons per month; 3) the City could realize between about \$78,600 and \$314,800 annually in reduced water and wastewater costs; and 4) retrofitted homes show no statistical difference in summer water use due to retrofitting.

The study was targeted at a 749-household neighborhood in an older Corpus Christi midtown area, constructed between the late 1940's and early 1950's. The neighborhood was characterized as low to middle-income and minority dominated, primarily Hispanic. An aggressive effort to recruit participants included a bilingual questionnaire and letter from the Corpus Christi mayor strongly encouraging participation, a second questionnaire

and letter to those residents not responding within two weeks, a personal door-to-door campaign to invite participation in the program, and a door-to-door effort by a neighborhood Boy Scout troop distributing the free retrofit kits.



The Corpus Christi neighborhood where a free and voluntary plumbing retrofit was tested for water savings.

About one-quarter of the households (195 homes altogether) participated in the retrofit study for the two-month period of November and December, 1993. The participating households received free kitchen and bathroom plumbing retrofit devices. Seventy percent of the participating households installed the devices and kept them in place for the duration of the study. The kits contained one kitchen faucet aerator, two shower heads, two toilet "tummies" (displacement bags), and two bathroom faucet aerators. The first phase of the study was done during winter months when there is little or no outdoor watering and the effect of indoor conservation plumbing devices can most easily be detected.

The participating households as a whole used an average of 65.5 gallons per capita (person) per day (gpcd) during the November-December, 1993 study period. The retrofitted households used an average of 59.4 gpcd, while non-retrofitted households used an average of 78.5 gpcd. The water savings from the retrofit amounted to 13% when study water use was compared to the average historic water use for those households participating in the study. That is equal to an average savings of 9.3 gpcd, which is 864 gallons per household per month. The total water savings attributed to all retrofitted households during the study was estimated at 168,480 gallons per month, which amounts to 6.24 acre-feet of water saved per year.

The second phase of the study compared summer water use and found no significant difference between retrofitted and non-retrofitted homes. The research showed that the families who chose to retrofit had homes that were slightly larger and more expensive, and therefore used more water in the summer than the non-retrofitted homes. That higher outdoor water use offset any indoor water savings so that retrofitted homes had no net savings in the summer.

While most would agree that retrofit devices can indeed save water, many still question whether a "give-away" retrofit program is economically viable. Prouty's study shows that the City of Corpus Christi could spend about \$310,800 on kits for a city-wide program,

and save about \$314,800 a year in reduced water and wastewater costs. The payback time for a city-wide program would range from about 1 to 4 years. For more information, contact Prouty at (512) 994-2436.

Access Water Savers, TWRI On-Line

Information about water conservation and other water and environmental related issues in Texas is now available over the Internet. The Texas Water Resources Institute (TWRI) has developed a "world wide web" site called Texas WaterNet. The site lets users access and download information on TWRI and its publications and programs and allows them to link to sites with additional information. "We think this use of the Internet will benefit many people interested in water conservation and reuse," said Ric Jensen, TWRI Information Specialist, who developed the site with Steve Fuller and Jonathan Jones. "More people will be able to read *Texas Water Savers* and other TWRI publications and learn more about TWRI. They won't have to keep scores of back issues of our newsletters, because they are now available on-line."

Savers, Texas Water Resources, New Waves, Texas On-Site Insights] published during the last three years. Eventually, TWRI will make all the back issues available. Texas WaterNet also includes information on TWRI's 1995 "Water for Texas Conference," including a complete list of speakers. Texas WaterNet lets users search the contents of the site for specific or predefined keywords. The site also lets users read about current TWRI research projects and contains job descriptions and biographical sketches for TWRI personnel.

Jensen also said that *Texas Water Savers* may have special interest to readers wanting to know more about conservation. For example, TWRI is now soliciting word-processed papers dealing with conservation and reuse in Texas and will post those papers on the WWW site. Also, TWRI is providing detailed information about *Texas Water Savers* sponsors on the WWW site. Finally, Texas WaterNet contains a direct link to the American Water Works Association's Water Wiser Clearing House and many other related sites. To access Texas WaterNet, computer users should be on the internet or have

a high speed modem of at least 14,400 bits per second. Internet users can view the site with such widely used software as Mosaic or Netscape.

AWWA Makes Annual Conservation & Reuse Awards

The 1994 Conservation and Reuse Awards from the Texas Section of the American Water Works Association (AWWA) were announced at the annual AWWA meeting held April 11-12 in Corpus Christi. Awards are given each year to utilities and companies that have shown exceptional dedication to water conservation and the application of water reclamation and reuse. Awards are given in the categories of small and large utilities in both *direct* conservation (actions that lead directly to reductions in water consumption) and *indirect* conservation (actions such as reuse that lead indirectly to reduced water consumption).

TWRI salutes this year's winners:

Direct category

- Clear Lake City Water Authority
- City of Austin
- Environmental and Conservation Services Department
- Koch Refining

Indirect category

- City of Cedar Park
- San Antonio Water System
- Corpus Christi Xeriscape Coalition

Bob Derrington Reclamation Award

City of Odessa

The winners in the direct category were, for small utility, Clear Lake City Water Authority; for large utility, City of Austin Environmental and Conservation Services Department; and for non-utility, Koch Refinery.

The Clear Lake City Water Authority was recognized for its strides in water conservation through a wastewater reclamation system. The reclamation and reuse system was implemented to address limited supplies and increased water requirements. Wastewater is treated and then sold for use in landscape irrigation at area country clubs and at the University of Houston at Clear Lake.

The "Xeriscape It!" Rebate Program brought recognition to the City of Austin. The program offers rebates of up to \$240 to residents who install drought-tolerant buffalo grass and/or xeriscape shrubs or ground covers in areas that receive more than six hours

of sunlight each day. Water savings from this program are estimated to be 175 gallons per day for each xeriscape, or a total of 38,325 gallons per day in the Austin area. The concept of "xeriscape" includes seven steps in planning and carrying out a naturalized, water-conserving landscape including such practices as using native plant species in landscapes to reduce water demand.

The Koch Refining Company was recognized for its commitment to improving process efficiency and reducing water consumption. Koch Refining processes crude oil and purchased feedstocks into fuel and chemicals. Koch Refining has spent tens of millions of dollars in the last few years to improve efficiencies of the refinery's water handling systems including supply, raw water treatment, distribution, reuse, and wastewater treatment.

Winners in the indirect category include, for small utility, the City of Cedar Park; for large utility, the San Antonio Water System; and for non-utility, the Corpus Christi Xeriscape Coalition. The special Bob Derrington Reclamation Award went to the City of Odessa.

The City of Cedar Park Water Utility gained recognition for its outstanding Summer Water Conservation Public Education Campaign. The effort was designed to reduce summer peak demands and included odd/even watering restrictions between 11 a.m. and 6 p.m. The program also included distribution of water conservation information and public appearances to publicize the need for conservation. The "H2O C.O.P." (Conservation On Patrol) Campaign utilized city employees to watch for water use violations calling for educational follow-up. Summer peak demand was reduced and the program reached an 85% compliance rate by summer's end.

The San Antonio Water System redesigned its water billing system, gaining praise for its efforts to emphasize water conservation on the bills and for implementing an aggressive rate structure for water that penalizes excessive use. The city's new water bills include personalized messages comparing monthly water use with the same month last year, average use for the customer's neighborhood, monthly water use, and graphs of Edwards Aquifer levels. The bills help residents understand their water use, and the relationship between use and their bills. It also promotes conservation by showing that reduced water use means lower water bills. Through the program, San Antonio has seen a 20% decrease in discretionary water use.

The Corpus Christi Xeriscape Coalition was recognized for its outstanding contribution to water conservation through education on xeriscape landscaping. The Coalition was formed in 1991, and has begun building the Corpus Christi Xeriscape Learning Center and Design Garden. The facility's mission is to educate and motivate citizens to conserve water and energy by landscaping that includes xeriscape principles. The Center will have demonstration gardens with examples of different xeriscape grasses, plants and shrubs. It will also tell the story of water supply in south Texas, explain the benefits of water conservation, and demonstrate the effectiveness of water reuse by collecting rainwater

and the water condensing from a nearby air conditioning unit to be used in landscape irrigation.

The AWWA's special award for outstanding effort in water reclamation and reuse, the Bob Derrington Reclamation Award, went to the City of Odessa Utilities Department for its establishment of an effluent reuse system for golf course irrigation, as well as landscape irrigation at the University of Texas of the Permian Basin and the Texas Department of Transportation. The savings from this reuse is approximately 3 million gallons per day. The water reclamation plant is being expanded to treat effluent to a higher quality to allow for distribution for residential landscape irrigation.

For more information on these awards, contact AWWA member Cheri Vogel at the Lower Colorado River Authority at (512) 473-3333.

Clear Lake Reclaims Wastewater in an Award-Winning Project

The Clear Lake City Water Authority (CLCWA) has already reduced its potable water use through reclamation and reuse by as much as 5% since 1992. Soon, the strain on potable water supplies will be further reduced by expanding the reclamation water customer base. The CLCWA was recognized by the American Water Works Association (AWWA) recently when it received one of AWWA's annual Conservation and Reuse Awards. Efforts by the CLCWA to reduce potable water use through reclamation and reuse have earned them the 1994 AWWA award for outstanding efforts in water conservation by a small utility.



This is the pump station and ozone treatment facility used by the Clear Lake City Water Authority to disinfect reclaimed wastewater for reuse.

The CLCWA supplies water, wastewater treatment and drainage facilities to about 50,000 residents, the University of Houston -- Clear Lake, and the NASA Johnson Space Center. The authority purchases 90% of its water from the City of Houston, but continuous growth in the Clear Lake area has increased the requirements for

water. Additional water will not be available until the next planned expansion of Houston's treatment plant due within 10 years.

To cope with the possibility of shortages and with the strains on the potable water supply, the CLCWA implemented a wastewater reclamation system. Since 1992, reclaimed wastewater has been supplied to the University of Houston -- Clear Lake, and to the Bay Oaks Country Club. During 1993, the University of Houston -- Clear Lake purchased and used 5 million gallons of treated wastewater to irrigate soccer fields, and the Bay Oaks Country Club purchased and used approximately 108 million gallons for landscape irrigation. Between the two, reliance on potable water delivery from the water authority has declined 3 to 5%.

A third customer (the Clear Lake Golf Course) will soon come on line for treated wastewater. There will still be unused capacity in the reclamation system, which was designed to be versatile enough to accommodate the needs of new customers. Most of the reclaimed water being delivered currently is delivered at night, when most landscape irrigation occurs. The water is treated with ultraviolet disinfection and chlorination. The water has to be delivered at sufficient pressure (50 pounds per square inch) to the University of Houston --Clear Lake because the soccer fields are irrigated with a single large-capacity water cannon. The water also has to be delivered at high volume to accommodate golf course needs.

The reclaimed water is of very high quality, having been filtered and exposed to ultraviolet disinfection and chlorination, and the effluent quality typically exceeds permit requirements. The reclamation has been successful in reducing peak summer demands in addition to the overall decline in potable water use.

For more details, contact David G. Scheffer Engineers, the Houston company that designed the facility and is helping generate new customers, at (713) 686-8060.

Residential Xeriscapes Save Water in Austin

The City of Austin, Water Conservation Division released an evaluation report of the city's residential xeriscape project, concluding that xeriscape programs are generally effective enough to promote them in rebate programs, and that xeriscape is capable of significantly contributing to the city's goal of a 10% decrease in peak day water demand by the year 2000. The report, *Xeriscaping: Promises and Pitfalls* summarizes a comparison study of water consumption in Austin in 1992-1993. The goal was to determine the water savings potential of xeriscape. Study results show that reduction in observed water consumption is roughly 30% in Austin xeriscape landscapes. Xeriscape landscaping involves use of native plant species that require little or no supplemental watering.

Xeriscape landscaping is generally regarded to be an effective water conservation measure. However, many questions remain as to the specific potential for water savings, as well as the many factors that work to determine whether a given household establishes a xeriscape. The Austin study sought to confirm the preliminary water savings associated with xeriscape, explore other landscape and social-economic factors that constrain or increase the water savings, and explore the possible association of xeriscape with higher water quality.

Some of the key findings in the study include:

- Buffalograss and no grass xeriscapes provide about a 30% or 175 gallons per day (gpd) reduction in water use compared to St. Augustine grass,
- Common Bermuda and mixed grasses (not commonly viewed as xeriscape grasses in other studies) give about a 15% (90 gpd) reduction in water use,
- Lot size does not change the relationship between xeriscape and water consumption; in other words, xeriscape produces the same absolute reduction regardless of lot size,
- Irrigation systems are associated with about 38% (214 gpd) increased water use,
- High income areas are associated with a 57% (324 gpd) increase in water use; conversely, lower income areas are associated with a 28% (161 gpd) decrease in water use, and
- The more money spent per year on landscaping and the presence of a swimming pool tend to be associated with increased water use (an average of about 36% and 31% respectively).

Austin maintains an active xeriscape program, including a rebate program, a Xeriscape School, and other xeriscape promotions. For more information on these programs or on the results of the recent study, contact Tony Gregg with the City of Austin at (512) 499-3557.

Odessa Moves Ahead in Wastewater Reclamation and Reuse

The City of Odessa is responding to strains on its potable water supply by undertaking an aggressive residential wastewater reuse program targeted at new neighborhoods in the growing metropolitan region. Odessa's past, present, and future experience with water reuse earned the city the 1994 "Bob Derrington Reclamation Award" from the American

Water Works Association (AWWA) annual conservation and reuse awards. The Bob Derrington Award memorializes the late Director of Utilities for the City of Odessa, which also dedicated its new wastewater treatment plant to Derrington and his achievements.



The Bob Derrington Water Reclamation Plant in Odessa already provides reclaimed wastewater to golf courses and public buildings.

Water reuse is not

new to Odessa, long recognized as a leader in water conservation in Texas. The City began providing treated effluent for industrial reuse as early as 1956. In 1985, Odessa initiated a landscape irrigation reuse program that identified a number of potential customers for the reuse water. Finally, in 1993, the City began construction of a model effluent reuse system (the Bob Derrington Water Reclamation Plant) and by July, 1994, Odessa had pumped its first treated effluent to the Ratliff Golf Course north of the City. That marked the beginning of unrestricted wastewater reuse for irrigation in Odessa, which now delivers high quality effluent for irrigation to three golf courses, the University of Texas of the Permian Basin, and the Texas Department of Transportation.



Schematic showing plans for a double water line system to allow for wastewater reuse for non-potable purposes in a residential setting.

Today, Odessa, again on the leading edge of water conservation and reuse program implementation, is pursuing the State's first dual water supply system that will use highly-treated effluent for lawn watering in new residential areas. That means that when the system is in place, homes in these new neighborhoods will be served with two water lines -- one that will deliver

potable water for inside use and one that will deliver treated effluent (non-potable) for outdoor use.

The possibility of residential reuse came up amid discussions of providing expanded reuse water for public facilities. Numerous citizen inquiries about the availability of reuse water for lawn irrigation prompted Odessa officials to look into the possibility of retrofitting existing neighborhoods for reuse, and installing reuse systems in new neighborhoods. A planned 120 residence subdivision is targeted as one potential site for residential reuse, and preliminary efforts are underway for obtaining appropriate regulatory approval for the project from the Texas Water Development Board and the Texas Natural Resource Conservation Commission (TNRCC).

For residential reuse and expanded public facility reuse to become a reality, certain alterations would have to be made at the Bob Derrington Water Reclamation Plant in Odessa. The plant, built in 1993, was named after the late Director of Utilities for the City of Odessa, who also pioneered many of the practical applications of water conservation technology in Texas. Expansions in the reuse system to accommodate

increased demand from public facilities will require about 16 additional miles of transmission line to deliver a peak demand of 3 million gallons per day (mgd). That level of expansion in pumping capacity and treatment process effectively doubles the quantity of reclaimed water provided by the system.

Odessa, the TWDB, and TNRCC are all travelling in uncharted waters in considering regulatory approval of this proposed project, as it would be the first residential reuse project in Texas. However, much can be learned from other states (such as Florida and California) that have already implemented residential reuse. Texas does provide some existing regulations and guidelines designed to minimize the possibility of public health effects from the potentially harmful constituents contained in wastewater. There are numerous water quality considerations to be addressed. For example, are there public health concerns? Is it possible for pathogenic bacteria, parasites, viruses and chemical constituents to be present in treated wastewater? Will there be offensive odors? How reliable is the reuse treatment and delivery system?

Existing regulations call for reclaimed water to be sampled and analyzed weekly when the intended reuse is for "unrestricted landscaped areas," such as residential lawns.

Whatever the eventual regulations hold, it is clear that the City of Odessa, in its quest for residential reuse, is forging a new water conservation trail for other Texas cities to follow. For more information on water reclamation and reuse, contact Byron Gaines at (915) 367-9007.

Koch Refining Pursues Award-Winning Water Conservation

The Koch Refining Company in Corpus Christi is in the water-intensive business of refining crude oil and purchased feedstocks into fuel and chemicals. The refinery's emphasis on water conservation, water use efficiency, and water reuse has earned it an American Water Works Association (AWWA) award for a company showing outstanding commitment to water conservation and reuse.

In March 1992, the City of Corpus Christi asked industrial water users to begin preparing water conservation and drought contingency plans as part of the City's reservoir management plan. The Koch water conservation plan boasts current water savings of 6.7 million gallons per day (mgd), and is the result of cooperative efforts between the City, the Port of Corpus Christi Board of Trade, and Koch Refining Company.

Koch Refining has spent tens of millions of dollars in the last several years to improve water use efficiency and cost effectiveness of the refinery's water handling systems. Their philosophy in water conservation and management has been to implement cost effective operating practices and technology designs that minimize the net amount of make-up water needed for the refinery, thereby reducing the net operating cost. Since 1990, Koch Refining has invested more than \$60 million on water related projects. This emphasizes the importance the company places on effective water management, including the cost effective conservation of water through source reduction, substitution and recycling/reuse.

Since 1981 more than 14 water conservation projects and practices have been introduced. Recently, the plant has begun to treat raw water from the Nueces River and use it as clarified water instead of using city water. The clarified water is being recycled, saving about 360,000 gallons of water per day. Also, by installing and utilizing reverse osmosis technology in boiler feed water pretreatment, the plant is saving another 50,000 gallons of water per day.

These programs and others have helped Koch save substantial amounts of water. While total refinery production more than doubled between 1982 and 1994, water use actually declined during that period. Without conservation, daily water use at the plant would be 12.6 million gallons, compared to the actual 5.9 million gallons per day. That savings represents approximately 6.7 million gallons of water per day that is available for other purposes.

**Conservation Project Water Saved
(in millions of gallons per day)**

125 air cooled heat exchangers	4.84
Recycling of cooling tower water	0.80
Reuse sour water stripper bottoms	0.22
Revamp boiler house cooling water	0.03
Revamp condensate header	0.01
Recover spray/scrubber tower water	0.19
Co-Gen blowdown controller	0.01
Steam trap collection	0.12
Blowdown controller	0.02
Revamp main cooling tower	0.01
Fix raw water line leaks	0.08
Water clarifying system	0.30
Reverse osmosis system	0.05
Improved maintenance	0.01
Total	6.69

For more information on water conservation at Koch Refining, contact Chief Environmental Engineer Frank White at (512) 242-8755.

New TWDB Booklet: Test Your Own Water Meter

A new booklet on how to test water meters has been prepared by the Texas Water Development Board (TWDB) and is available free of charge. The information is targeted primarily to smaller municipal utilities, who typically lack the resources to finance expensive commercial metering services. The booklet, *Low-Cost and No-Cost Ways to Test Your Own Meters*, provides specific information on how to measure water meter accuracy with little or no cost to the utility.

Meter errors are part of the bigger problem of unaccounted-for water, water that never makes it onto the customers' bills. Water may be unaccounted for because: 1) it is an unmetered use such as line flushing, fire fighting, etc.; 2) there is a source meter error (meaning that the utility system has incorrect information on how much water they

produce); 3) there are leaks in the distribution system; or 4) the customer's meters are in error (meaning that the utility is billing for an incorrect amount of water delivered).

The TWDB booklet points out that meters serve as the "cash register" of the water utility system, and that unaccounted-for water is like money straight out of the till. Even small meter errors (5-10%) can cause large revenue losses. Having meters properly calibrated is the first step in properly accounting for all water. The booklet describes how to perform calibration tests on production meters, commercial meters, and residential meters, and how to determine the percentage of meter error.

The TWDB offers free training and on-site technical assistance to utilities wishing to establish water audit and leak detection programs. For more information, contact the TWDB Conservation Section at (512) 463-8048.

Irrigation Audit Programs Beneficial Throughout State

Properly managing landscape irrigation is one area of proven water conservation in Texas and elsewhere. Cities throughout the State have irrigation audit programs to help residents better schedule their landscape waterings to enhance water conservation. In addition, corporations, school districts, commercial facilities, and city and county governments themselves are increasingly focusing on irrigation audits to help reduce water use and water costs. Recent results from two different programs, a city implementing irrigation audits and a statewide landscape irrigation auditor training program, show that audits continue to make a significant difference in outdoor water use.



Texas A&M University Extension staff member David Smith instructs a student in the Landscape Irrigation Audit program offered through the University.

The City of Austin initiated irrigation audits in 1992, and performed more than 400 audits during the summers of 1992 and 1993. Evaluation of those audits showed, among other things, that average post-audit water savings was about 200 gallons per day (gpd), and that most of the savings came from the

highest volume water users. The same generally holds true for the Texas Landscape Irrigation Auditing Training program whose focus is on large irrigation systems with high volume water use.

Both programs are designed to evaluate existing landscape irrigation practices and to identify ways of cutting back on water without compromising the landscape quality. In both cases, strides are being made in actual water conservation, and in proliferating public understanding about the importance of conservation.

Results of the pilot auditing program in the City of Austin will lead that city to target future irrigation auditing programs to high water users. In 1993, 90% of the total water

savings from the program were produced from 18% of the audits. Half the savings were produced from the top 8% of audits and the top 10 audits (3% of all audits) accounted for 30% of the total water savings. Actual water savings from the program ranged as high as 2,000 gpd with an average of 200 gpd in 1993, and 231 gpd in 1992.

The large variability in water savings appears to stem from some participants not following the irrigation schedule suggested by the audit. However, on the average, the audits successfully lengthened the time between waterings and the length of waterings. Eighty-six percent of the participants responding to a follow-up survey reported that they had used the schedule recommended by the auditor, and 82% of those reported that the schedule adequately watered their landscape. The Austin program was judged cost effective provided water savings from the audit continue for at least three years, and a future audit program was recommended.

The Texas Landscape Irrigation Auditing and Management Program (LIAM) is another example of success in irrigation water savings education. The LIAM program was established by Doug Welsh (Associate Professor and Extension Horticulturist, Department of Horticulture Sciences, Texas A&M University), Guy Fipps (Associate Professor and Extension Agricultural Engineer, Department of Agricultural Engineering, Texas A&M), and Joe Henggeler (Associate Professor and Extension Specialist, Texas A&M Extension Center, Ft. Stockton) in 1993 with a grant from TWDB and the Lower Colorado River Authority. The LIAM program has trained more than 100 representatives from school districts (including universities, colleges, and junior colleges), commercial landscape companies, cities and utilities, and other state, county and federal agencies through its LIAM Short Course. Unlike the Austin program which targets residential landscapes, LIAM participants typically manage or oversee groups who manage large irrigation systems on extensive landscapes. For many of them, landscape irrigation costs can run into the hundreds of thousands every year. The motivation to irrigate efficiently is spurred by the desire to save water in order to save money.

The two-day LIAM course prepares participants for the certification process through the Irrigation Association as a Certified Landscape Irrigation Auditor. Participants learn how to determine turf water requirements, take soil types and rooting depths into consideration, and how to determine irrigation system operation times. They also learn how to compute potential water and cost savings with implementation of the irrigation schedule produced in the audit.

An average of 20-40% water savings can be achieved from audits, saving water, money, and the indirect effect of reducing the potential for urban non-point source pollution associated with over-irrigation. These potential savings have motivated a number of clients to seek help through the LIAM program. For example, a college in North Texas wanted to better manage irrigation of a soccer field on the college campus. The audit revealed that the soccer field was being watered for 20 minutes every day throughout the year, severely overwatering in the spring and fall. The college wanted to maintain green grass on the field throughout the year, so the field was routinely overseeded with annual

rye grass in the winter. Part of the excess watering in the winter months was to keep the rye grass green.

In another example, a Richardson based telecommunications company sought help through the LIAM program to reduce water costs spent maintaining the corporate headquarters landscape. In many cases, it is important to the landscape owners that the landscape be adequately maintained and that it stay green year around. The irrigation audits provide information about optimal watering amounts and timing needed to preserve landscape integrity, without wasting water.

One of the tools developed for the LIAM program by Welsh, Fipps, and A&M Extension staff member David Smith is a software program designed to compute water needs for various grass types in both warm season and cool season conditions. Part of what the participants in the LIAM short course learn is to utilize the scheduling program to optimize their irrigation timing and amounts. The program performs the calculations necessary for producing an irrigation schedule, and contains monthly rainfall and turf water requirements for 19 major metropolitan areas in Texas.

Participants also learn to evaluate the efficiency of their irrigation systems by measuring "delivery" of water throughout their system. Many large irrigation systems suffer from inconsistent delivery. This can lead to overwatering when some parts of the system deliver too little water -- system managers operate the whole system longer in an effort to make sure the dry spots get enough. The LIAM course teaches participants how to place catch devices on the ground under the irrigation system to measure actual sprinkler system performance including precipitation rate and distribution uniformity along with adjusting system run times to meet turf water requirements.

The results of the LIAM program have been so successful that a number of cities throughout Texas have sent representatives to take the course with an eye toward establishing their own municipal irrigation auditing programs. A number of cities and regional water authorities (Houston, Austin, the Lower Colorado River Authority) have done just that.

The benefits of landscape irrigation auditing efforts in the different programs throughout Texas are beginning to take shape. For more information on the Austin residential irrigation audit program, contact Tony Gregg at (512) 499-3557. For more information on the LIA program, contact David Smith at (409) 845-5614.