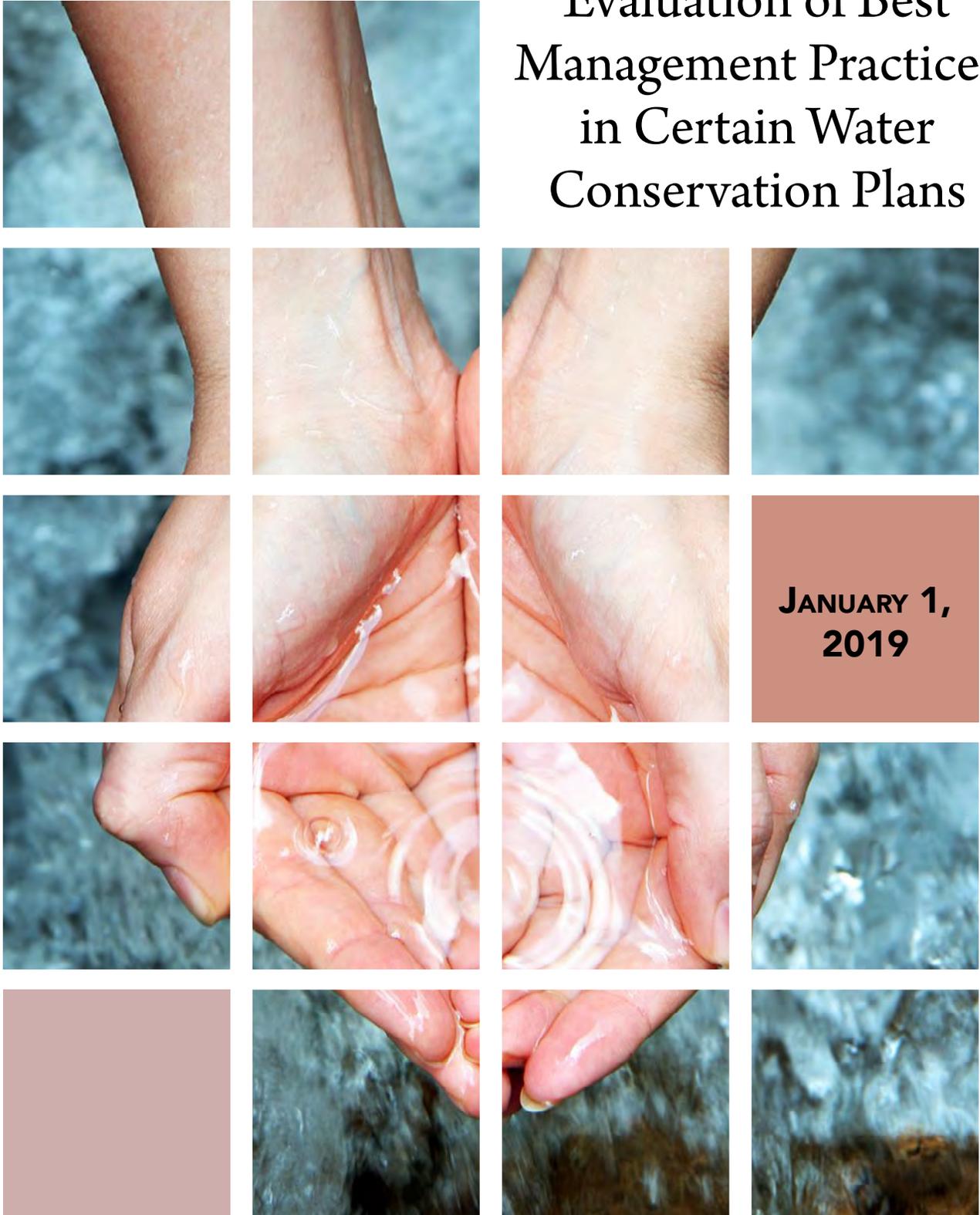


Evaluation of Best Management Practices in Certain Water Conservation Plans



**BIENNIAL REPORT TO THE
86TH TEXAS LEGISLATURE SESSION**

Evaluation of Best Management Practices in Certain Water Conservation Plans

Biennial Report to the Texas Legislature

Peter M. Lake, Chairman

Kathleen Jackson, Member

Brooke T. Paup, Member

Jeff Walker, Executive Administrator

January 1, 2019



This page is intentionally blank.

Table of Contents

Executive summary..... 1

Introduction..... 2

Best management practices..... 3

 Water conservation plans and minimum requirements..... 5

 Evaluating best management practices 6

Results..... 7

 Use of best management practices 8

 Examples of best management practices used in water conservation plans 10

 Looking forward 11

Conclusions..... 12

Appendix A..... A-1

Appendix B..... B-1

Appendix C..... C-1

Executive summary

In *Water for Texas: 2017 State Water Plan*, municipal water conservation strategies for the year 2070 are projected to provide 811,000 acre-feet to help meet identified needs for additional water supplies. This volume represents 9.6 percent of the total future need.

Municipal water conservation efforts in Texas are motivated by diverse goals such as addressing short and/or long-term water shortages, providing environmental protection, and avoiding or postponing the high costs associated with new water system improvements.

To ensure that these goals are attainable, Texas requires certain utilities to develop and submit water conservation plans. These plans should include conservation activities or best management practices that will be used to reach the utility's goals.

To determine how best management practices were being utilized, the 83rd Texas Legislature (2013) passed House Bill 3605 requiring the Texas Water Development Board (TWDB), when considering an application for financial assistance from a retail public utility that provides potable water service to 3,300 or more connections, to evaluate the utility's water conservation plan for compliance with the TWDB's municipal water conservation best management practices. The TWDB is also required to issue a report to the utility detailing the results of the evaluation and, no later than January 1 of each odd-numbered year, submit a written summary of the results of evaluations to the legislature.

The TWDB initiated its evaluation process in 2014 and submitted the first *Evaluation of Best Management Practices in Certain Water Conservation Plans* report on January 1, 2015. This submission to the 86th Texas Legislature is the third report in the series.

In fiscal years 2017 and 2018, the TWDB considered applications for financial assistance from 32 utilities with 3,300 or more connections. The utilities ranged in size from 3,360 connections (G-M Water Supply Corporation) to 913,357 connections (City of Houston), with a median size of 18,834 connections. Twenty-seven of the utilities were city owned, while five utilities were districts.

The evaluations showed that the use of best management practices varied from utility to utility. The best management practices most commonly included in the conservation plans were those that address some of the minimum requirements for a water conservation plan. They included:

- metering of all new connections and retrofitting of existing connections,
- system water audit and water loss control,
- public information, and

- water conservation pricing.

Many utilities actively undertake water conservation activities, though utility staff may not present their activities as formalized best management practices in their water conservation plan. While a 2017 *Statewide Water Conservation Quantification Project* found that awareness of the TWDB's best management practices is high, TWDB staff were often hard-pressed to identify best management practices in submitted water conservation plans. Additionally, although plans are required to have 5- and 10-year targets and goals for water savings, water conservation plans generally do not include any estimates of potential water savings from particular conservation activities.

This agency continues to refine the evaluation process and encourage utilities to use the TWDB's *Best Management Practices Guide*, found at <http://www.twdb.texas.gov/conservation/BMPs/Mun/index.asp>, when developing and implementing their water conservation plans.

Introduction

In 2013, the 83rd Texas Legislature passed House Bill 3605 requiring the TWDB to establish thresholds for water loss to use when considering applications for financial assistance. Codified in Texas Water Code, Section 17.1245, the bill also states:

(a) In passing on an application for financial assistance from a retail public utility that provides potable water service to 3,300 or more connections, the board shall:

- (1) evaluate for compliance with the board's best management practices the utility's water conservation plan required under Section 13.146; and*
- (2) issue a report to a utility detailing the results of the evaluation conducted under Subdivision (1).*

(b) Not later than January 1 of each odd-numbered year, the board shall submit to the legislature a written summary of the results of evaluations conducted under Subsection (a)(1).

The purpose of this report is to summarize the evaluations of best management practices for utilities with 3,300 or more connections that applied for financial assistance from the TWDB during fiscal years 2017 or 2018. A conservation plan evaluation includes a listing of the municipal water conservation best management practices used by the utility and identifies best management practices that the utility could consider for use when revising its water conservation plan in the future.

The TWDB initiated the evaluation process in 2014 and submitted the first *Evaluation of Best Management Practices in Certain Water Conservation Plans* report to the legislature on January 1, 2015. This is the third report in the series.

Best management practices

As defined by Texas Administrative Code, Title 30, Section 288.1.(3), a best management practice is a voluntary efficiency measure that is intended to save a quantifiable amount of water, either directly or indirectly. Also, each best management practice should be clearly defined with a schedule of implementation and cost of implementation.

In Texas, best management practices are designed to be used by two planning processes. First, a water conservation plan uses best management practices to increase a utility's water-use efficiency and/or reduce water use and/or water loss. Second, the state's regional and state water plans use best management practices as part of strategies for meeting future water needs.

In 2003, the 78th Texas Legislature created the Water Conservation Implementation Task Force (Task Force) through Senate Bill 1094. One of the responsibilities of the Task Force was to review, evaluate, and recommend optimum levels of water-use efficiency and conservation for the state. The result of these efforts was a *Best Management Practices Guide* consisting of 21 municipal, 14 industrial, and 20 agricultural best management practices. Each best management practice had several elements that described efficiency measures, implementation techniques, implementation schedules, scope, procedures to estimate water savings, and cost-effectiveness considerations.

The Water Conservation Advisory Council (Council) succeeded the Task Force. Created in 2007 by the 80th Regular Session of the Texas Legislature with the passage of Senate Bill 3 and House Bill 4, the Council is charged with monitoring trends in water conservation implementation and new technologies for possible inclusion as best management practices. Working with the TWDB and the Texas Commission on Environmental Quality, the Council established a stakeholder process to review and revise best management practices. Now, changes to the *Best Management Practices Guide* are vetted by appropriate subject matter experts, interest groups, and state agencies.

The best management practices contained in the *Best Management Practices Guide* are voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and can be implemented within a specified timeframe. They are not exclusive of other meaningful conservation techniques that an entity might use in formulating a state-required water conservation plan. At the discretion of each entity, a best management practice can be

Evaluation of Best Management Practices

implemented individually, in whole or in part, or be combined with other best management practices or water conservation techniques to form a comprehensive water conservation program. The adoption of any best management practice is entirely voluntary, although it is recognized that once adopted, certain practices may require implementation through local laws such as city ordinances or resolutions.

The intention of the Council and stakeholders is for the guide to remain a living document that incorporates changes or additions on an ongoing basis. Periodic solicitations are made by the Council to encourage reviews of best management practices by stakeholders. As appropriate, the Council makes recommendations to the TWDB for future revisions to the *Best Management Practice Guide*. Since 2007, the Council has reviewed the existing list of best management practices created by the Task Force, developed four additional municipal best management practices, and updated existing best management practices as needed.

After reviewing recommended updates approved by the Council, and in consultation with the Texas Commission on Environmental Quality, the TWDB considers including the changes and updating the online *Best Management Practices Guide*. The guide now includes 25 municipal, 15 industrial, 21 agricultural, and 4 wholesale best management practices. The current 25 municipal best management practices are shown in Table 1. In 2018 the Council developed four new municipal best management practices for consideration by the TWDB, in addition to developing a commercial and institutional best management practices guide. These new best management practices are currently being evaluated by the TWDB for inclusion in the *Best Management Practices Guide* by January 2019.

Table 1. Current best management practices

**(Source: *Municipal Best Management Practices Guide*,
<http://www.twdb.texas.gov/conservation/BMPs/Mun/index.asp>.)**

Conservation coordinator
Cost-effectiveness analysis
Water survey for single-family and multi-family customers
Water conservation pricing
Wholesale agency assistance programs
Metering of all new connections and retrofit of existing connections
System water audit and water loss control
Athletic field conservation
Golf course conservation
Landscape irrigation conservation and incentives
Park conservation
Residential landscape irrigation evaluation
Public information

Evaluation of Best Management Practices

School education
Small utility outreach and education
Partnerships with nonprofit organizations
Conservation programs for industrial, commercial, and institutional accounts
Residential clothes washer incentive program
Showerhead, aerator, and toilet flapper retrofit
Toilet replacement programs
Water wise landscape design and conversion programs
New construction graywater
Rainwater harvesting and condensate reuse
Water reuse
Prohibitions on wasting water

Water conservation plans and minimum requirements

A water conservation plan is a strategy-planning document that describes how the water utility has historically used water, the utility's water-use targets, and an implementation plan to meet those targets. Activities within the water conservation plan should meet the targets to reduce the consumption of water, reduce the loss or waste of water, improve or maintain water-use efficiency, or increase recycling and reuse of water.

An entity must submit a water conservation plan in any one of these circumstances:

- The entity is a retail public water supplier with 3,300 or more connections.
- The entity is applying to the TWDB for financial assistance of more than \$500,000.
- The entity has certain surface water rights through the Texas Commission on Environmental Quality.

TWDB conservation staff receives and reviews water conservation plans in the first two instances above. In the third instance, the Texas Commission on Environmental Quality is responsible for reviewing the entity's water conservation plan, although the utility still provides a copy of its plan to the TWDB.

A water conservation plan must meet certain minimum requirements and should be no older than five years. The plan must provide information in response to 13 minimum requirements. If the plan does not provide information responsive to each minimum requirement, the applicant must include in the plan an explanation of why the requirement is not applicable.

Current water conservation plan minimum requirements are found in Texas Administrative Code, Chapter Section 363.15(b)(1) and include the following:

Evaluation of Best Management Practices

- A. A utility profile that includes water sales and use for the following classifications: residential (both for single-family and multi-family), commercial, institutional, industrial, agricultural, and wholesale, as appropriate.
- B. Five-year and 10-year targets that are specific and quantified for water savings, goals for water loss programs in gallons per capita per day, and goals for municipal use and residential use in gallons per capita per day. A base water-use volume should be included to calculate savings.
- C. A schedule for implementing the plan that achieves the applicant's targets and goals.
- D. A method for tracking the implementation and effectiveness of the plan. The plan should measure progress annually and evaluate progress toward meeting the goals.
- E. A master meter to measure and account for the volume of water diverted from the source of supply.
- F. A universal metering program for both customer and public uses of water, meter testing and repair, and periodic meter replacement.
- G. Measures to determine and control water loss.
- H. A continuous program of leak detection and repair, as well as accounting for the transmission, delivery, and distribution of water within the system.
- I. A program of continuing education and information regarding water conservation.
- J. A water rate structure that is not "promotional" and does not encourage the excessive use of water.
- K. A means of implementation and enforcement, evidenced by adopting the plan.
- L. Documentation that the regional water planning group for the service area of the applicant has been notified of the applicant's water conservation plan.
- M. Inclusion of the current drought contingency plan.

The water conservation plan may also include other conservation methods or techniques that the utility deems appropriate.

Evaluating best management practices

As required by Texas Water Code, Section 17.1245, TWDB staff reviews the water conservation plan of each retail public water supplier with 3,300 or more connections that applies for financial assistance from the TWDB. The plan review focuses on:

- historical water use, as presented in the utility profile, compared to the 5- and 10-year targets;
- the process by which the entity developed its water-use targets; and
- the activities and best management practices included in the water conservation plan.

Evaluation of Best Management Practices

The information from this review is summarized in the Water Conservation Review sheet, which accompanies the utility's application throughout the TWDB's financial assistance review process (Appendix A). If necessary, the agency contacts the entity for clarification or additional information.

As part of the review report sent to the utility applicant, staff identifies the activities listed in its water conservation plan and tabulates them against the current list of 25 municipal best management practices included in the *Municipal Best Management Practices Guide* (Appendix B). Staff also notes the best management practices that a utility may wish to consider in its future water conservation plans. This tabulated information is sent to the utility via regular mail (for an example, see Appendix C).

Results

In fiscal years 2017 and 2018, TWDB staff reviewed the water conservation plans of 32 utilities that have 3,300 or more connections and have submitted financial applications to the TWDB. The entities included:

Acton Municipal Utility District	City of Hurst
Amarillo Municipal Utility System	City of La Porte
City of Abilene	City of Lubbock
City of Alamo	City of McAllen
City of Arlington	City of Pearland
City of Azle	City of San Juan
City of Corpus Christi	City of San Marcos
City of Dallas	City of Stephenville
City of Del Rio	Crystal Clear Special Utility District
City of Eagle Pass	G-M Water Supply Corporation
City of Edinburg	Greater Texoma Utility Authority-City of Princeton
City of Ennis	Greater Texoma Utility Authority-City of Sherman
City of Euless	Johnson County Special Utility District
City of Fort Worth	Mustang Special Utility District
City of Granbury	San Antonio Water System
City of Grand Prairie	
City of Houston	

Through this process and in discussions with utilities regarding their plans, the TWDB has made several observations:

- 1) Some utilities do not consider or describe their conservation activities in terms of formalized best management practices.

Evaluation of Best Management Practices

- 2) Many utilities list potential best management practices or conservation activities they may consider, but not ultimately pursue, when implementing their plans.
- 3) Although conservation plans are required to have 5- and 10-year targets and goals for water savings, the plans often do not include any estimates of potential water savings from a particular conservation activity.

In evaluating submitted water conservation plans for inclusion of TWDB's best management practices, staff were often hard-pressed to identify the inclusion of specific best management practices. For example, a utility may promote the replacement of older water-use fixtures, such as toilets, with high-efficiency models. Although it is a conservation activity, the TDWB considers it to be an education best management practice rather than a toilet replacement best management practice because the activity *promotes* the replacement of toilets rather than financially *supporting* the replacement of toilets. Also, water conservation plans often may not include any discussion of the process a utility uses to determine what best management practices to include in its water conservation plan.

Use of best management practices

The use of best management practices varies from utility to utility (Table 2). For example, the San Antonio Water System water conservation plan included 20 best management practices, while the cities of Del Rio, Eagle Pass, and Granbury, as well as the G-M Water Supply Corporation, each included four best management practices in their water conservation plans. Twenty-four of the 25 municipal best management practices were included by at least one utility evaluated in this report.

The reviewed utilities all included, at a minimum, three best management practices:

- metering of all new connections and retrofit of existing connections,
- system water audit and water loss control, and
- public information.

Completing the top 10 list, the most frequently identified best management practices were:

- water conservation pricing,
- school education programs,
- water reuse,
- prohibitions on wasting water,
- landscape irrigation conservation and incentives,
- establishment of a conservation coordinator, and
- partnerships with nonprofit organizations.

Evaluation of Best Management Practices

None of the utilities used the “new construction graywater” best management practice in their water conservation plan.

Table 2. List of utilities and identified best management practices.

	Conservation coordinator	Cost effective analysis	Water survey for single-family and multi-family customers	Water conservation pricing	Wholesale agency assistance Programs	Metering of all new connections and retrofit of existing connections	System water audit and water loss control	Athletic field conservation	Golf course conservation	Landscape irrigation conservation and incentives	Park conservation	Residential landscape irrigation evaluation	Public information	School education	Small utility outreach and education	Partnerships with nonprofit organizations	Conservation programs for ICI accounts	Residential clothes washer incentive program	Showerhead, aerator, and toilet flapper retrofit	Toilet replacement programs	Water wise landscape design and conversion programs	New construction graywater	Rainwater harvesting and condensate reuse	Water reuse	Prohibitions on wasting water
Acton MUD				✓		✓	✓					✓	✓												
Amarillo MUS				✓		✓	✓									✓								✓	✓
City of Abilene	✓			✓	✓	✓	✓		✓	✓			✓	✓	✓		✓				✓			✓	✓
City of Alamo				✓		✓	✓						✓	✓											✓
City of Arlington				✓		✓	✓			✓		✓	✓			✓	✓	✓						✓	✓
City of Azle				✓		✓	✓		✓				✓	✓						✓				✓	✓
City of Corpus Christi	✓			✓		✓	✓			✓	✓	✓	✓	✓		✓	✓				✓		✓	✓	✓
City of Dallas	✓			✓		✓	✓		✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓
City of Del Rio						✓	✓					✓	✓												
City of Eagle Pass				✓		✓	✓					✓	✓												
City of Edinburg						✓	✓		✓		✓													✓	
City of Ennis						✓	✓				✓		✓	✓							✓			✓	
City of Euless				✓		✓	✓					✓													✓
City of Fort Worth	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓			✓	✓	✓	✓			✓	✓	✓
City of Granbury						✓	✓					✓	✓											✓	✓
City of Grand Prairie				✓		✓	✓			✓			✓										✓		✓
City of Houston				✓		✓	✓						✓	✓					✓					✓	
City of Hurst						✓	✓						✓	✓		✓									✓
City of La Porte				✓		✓	✓					✓	✓											✓	✓
City of Lubbock				✓		✓	✓		✓				✓	✓										✓	✓
City of McAllen				✓		✓	✓			✓			✓											✓	✓
City of Pearland				✓		✓	✓						✓											✓	✓
City of San Juan				✓		✓	✓			✓			✓	✓										✓	✓
City of San Marcos	✓			✓		✓	✓		✓			✓	✓	✓			✓	✓	✓	✓			✓	✓	✓
City of Stephenville				✓		✓	✓					✓	✓											✓	✓
Crystal Clear SUD				✓		✓	✓						✓	✓					✓						✓
G-M WSC				✓		✓	✓						✓	✓											✓
GTUA-City of Princeton				✓		✓	✓			✓			✓	✓											✓
GTUA-City of Sherman	✓					✓	✓			✓			✓	✓											✓
Johnson County SUD	✓			✓	✓	✓	✓						✓	✓		✓									✓
Mustang SUD	✓			✓		✓	✓				✓		✓	✓			✓	✓	✓	✓	✓			✓	✓
San Antonio WS	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- GTUA – Greater Texoma Utility Authority
- MUD – Municipal Utility District
- MUS – Municipal Utility System
- SUD – Special Utility District
- WS – Water System
- WSC – Water Supply Corporation

There is one underused best management practice that TWDB conservation staff think each utility should consider when updating its water conservation plan — that is “partnerships with nonprofit organizations.” Under this best management practice, the utility works closely with organizations such as local Master Gardener programs, Scout troops, service organizations, and

Evaluation of Best Management Practices

youth groups that can provide the utility with a presence in the community and increase its public awareness and involvement. For example, the San Antonio Water System has contracted with volunteer and governmental organizations having complementary goals to offer workshops, participate in events, and assist with research and program management for both plumbing retrofit programs and outreach for landscape efficiency programs.

Examples of best management practices used in water conservation plans

This section presents example elements of best management practices being used by some utilities.

Mustang Special Utility District (6,879 connections) has implemented a water conservation demonstration program (a “public information” best management practice) at its facilities that includes:

- use of native and adapted drought-tolerant plants in most of its landscaping;
- irrigation of facilities during off-peak times to avoid evaporative loss, and
- irrigation limited to the amount needed for landscape survival and health and by frequency and time-of-day.

City of Abilene (54,432 connections) lessens the demand on the city’s raw water sources by providing treated wastewater (a “water reuse” best management practice) to agricultural irrigators within the city’s service area. The city assists irrigators where feasible and practical to utilize reclaimed wastewater for irrigation.

City of Corpus Christi (94,096 connections) has implemented the Plumbers to People program (a “prohibitions on wasting water” best management practice). This affordability program provides plumbing assistance to low-income residential customers seeking to repair plumbing fixtures in their homes. The intent of the program is two-fold: (1) to eliminate the cycle of uncollected high-water bills resulting from water leaks, and (2) to promote water conservation. Eligibility is based on the individual’s income and need for assistance. The city arranges for a contracted plumber to conduct repairs at the individual’s home, send a report, and invoice the city.

City of Arlington (149,781 connections) has a series of landscape water management regulations that are intended to minimize waste in landscape irrigation. The adopted regulations include the following elements:

Evaluation of Best Management Practices

- Year-round prohibition of outdoor watering with sprinklers from 10:00 a.m. to 6:00 p.m. (a “prohibitions on wasting water” best management practice). Watering by hand and with soaker hoses is allowed.
- Customers responsible for preventing avoidable waste of water, including loss from a controllable leak or from an irrigation system malfunction, such as a broken sprinkler and/or overspray on impervious surfaces with runoff greater than 150 feet (a “prohibitions on wasting water” best management practice).
- Installation of operational rain and freeze sensors on all new irrigation systems (a “landscape irrigation conservation and incentives” best management practice).
- Retrofitting of existing irrigation systems installed prior to January 1, 2007, with a rain and freeze sensor (a “landscape irrigation conservation and incentives” best management practice). Single-family residential, duplex properties, or individually metered townhomes or condominium units are exempt.
- New irrigation systems to comply with state design (TAC Title 30, Part 1, Chapter 344) and City of Arlington (Ord. No. 08-108) installation regulations (a “landscape irrigation conservation and incentives” best management practice).
- Enforcement of regulations, with warnings followed by possible fines or suspended water services for continued or repeat violations (a “prohibitions on wasting water” best management practice).

Dallas Water Utilities (333,057 connections) and the Dallas City Council authorized a hospitality program (a “conservation programs for institutional, commercial and industrial accounts” best management practice) to encourage hotels, motels, and restaurants to expand efforts to save water by volunteering to participate in the city’s program. Participating hotels and motels encourage guests to use fewer linen and towel changes, and serve water by request only in their dining areas. The city provides free public service announcements to participating lodging facilities to educate guests about the program. Dallas area restaurants are also encouraged to serve water by request only. Free marketing and promotional materials are provided for participating establishments.

Looking forward

In addition to recognizing the need to assist utilities in identifying appropriate best management practices to include in their water conservation plans, the 85th Texas Legislature appropriated funding to develop a municipal water conservation planning tool to use in the development of conservation plans and regional water plans. The intent is to help staff and consultants developing water conservation plans to identify the cost/benefit of appropriate best management practices.

Evaluation of Best Management Practices

The planning tool will display the estimated water savings and costs for documented best management practices and other conservation activities, both individually and as a package. Such savings and cost information will assist utility staff in determining which activities will help meet the 5- and 10- year goals in their water conservation plans. The Water Conservation Planning Tool will be available for utilities to use when revising their water conservation plans that are due in the spring of 2019.

Conclusions

As a result of this evaluation of best management practices, the TWDB can make the following observations:

- Utilities do not always consider their water conservation activities in terms of best management practices.
- The best management practices most widely used in water conservation plans are those that address the minimum requirements of a water conservation plan.
- The extent to which a utility considered different best management practices before deciding on their inclusion in its water conservation plan remains uncertain.
- What best management practices a utility has implemented that are not included in its water conservation plan also remains uncertain.

TWDB staff will continue to refine the evaluation process and encourage utilities to use the TWDB's *Best Management Practices Guide* when developing and implementing their water conservation plans.

Appendix A

Sample water conservation review

Evaluation of Best Management Practices

WATER CONSERVATION REVIEW

Entity: City of Good Waters

Review date: October 2017

WATER CONSERVATION PLAN DATE: December 2014 **Approvable** **Adopted**

	Total GPCD	Residential GPCD	Water Loss GPCD	Water Loss Percent
Baseline	146	56	21	14
5-year Goal	145	54	19	13
10-year Goal	143	51	17	12

WATER LOSS AUDIT YEAR: 2016

Total water loss (GPCD): 11 Total water loss (percent): 8 Wholesale Water
 Total no. of connections: 886 Length of mains (miles): 23 Connections per mile: 39

If > 16 connections per mile and > 3,000 connections, Infrastructure Leakage Index (ILI): NA

WATER LOSS THRESHOLDS:

	Apparent Loss Gallons per connection per day	Real Loss Gallons per mile per day	Real Loss Gallons per connection per day	Apparent Threshold Gallons per connection per day	Real Threshold Gallons per mile per day	Real Threshold Gallons per connection per day
If population ≤ 10K, connections/mile < 32 :	NA	NA	NA	NA	NA	NA
If population ≤ 10K, connections/mile ≥ 32 :	1	NA	24	16	NA	50
If population > 10K :	NA	NA	NA	NA	NA	NA

Does the applicant meet Water Loss Threshold requirements? Yes No NA

ADDITIONAL INFORMATION:

All uses, except for flushing, firefighting, and related drills, are metered. The city does, however, document an estimation for the amount of water used for unmetered activities. The leak detection program includes visual inspection, notice of pressure decreases, and customer notification. The water superintendent prepares monthly internal reports, including total water produced and total sales. Unauthorized water usage is not believed to represent a significant amount of water loss. All department personnel under supervision of the utility's director shall be made aware of the different types of leaks and how to detect and report them. Educational materials are distributed once a year during high use periods, given to new customers, and distributed through various other channels of communication.

STAFF NOTES AND RECOMMENDATIONS:

This project will replace an existing elevated storage tank that is severely deteriorated, rehabilitate unreliable high service pumps, and replace deteriorated water lines with excessive leaks.

Evaluation of Best Management Practices

DEFINITIONS

Adopted refers to a water conservation plan that meets the minimum requirements of the water conservation plan rules and has been formally approved and adopted by the applicant's governing body.

Apparent loss refers to unauthorized consumption, meter inaccuracy, billing adjustments, and waivers.

Approvable refers to a water conservation plan that substantially meets the minimum requirements of the water conservation plan rules but has not yet been adopted by the applicant's governing body.

Best Management Practices are voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and that can be implemented within a specific time frame.

GPCD means gallons per capita per day.

Infrastructure Leakage Index (ILI) is the current annual real loss divided by the unavoidable annual real loss (theoretical minimum real loss) and only applies to utilities with more than 5,000 connections, average pressure greater than 35 psi, and a connection density of more than 32 connections per mile. The **ILI** is recommended to be less than 3 if water resources are greatly limited and difficult to develop, between 3 and 5 if water resources are adequate to meet long-term needs but water conservation is included in long-term water planning, and between 5 and 8 if water resources are plentiful, reliable, and easily extracted. The **ILI** is recommended as a benchmarking tool, but until there is increased data validity of the variables used in the calculation, the **ILI** should be viewed with care.

NA means not applicable.

Produced water is the total amount of water purchased or produced by the utility.

Real loss comes from main breaks and leaks, storage tank overflows, customer service line breaks, and leaks.

Residential GPCD is the amount of water per capita used solely for residential use and ideally includes both single and multi-family customer use.

Total baseline GPCD is the amount of all water purchased or produced by the utility divided by the service area population and then divided by 365.

Total water loss is the sum of the apparent and real water losses.

Water loss is the difference between the input volume and the authorized consumption within a water system. Water Loss consists of real losses and apparent losses.

Water Loss Thresholds are levels of real and apparent water loss determined by the size and connection density of a retail public utility, at or above which a utility receiving financial assistance from the Texas Water Development Board must use a portion of that financial assistance to mitigate the utility's system water loss.

Appendix B

Sample utility evaluation table

City of Good Waters

**Evaluation of Best Management Practices (BMPs)
2014 Water Conservation Plan**

BMPs	BMPs mentioned in the WCP	BMPs to consider for future WCP revisions	Comments
Conservation coordinator		✓	This BMP can provide important focus on your conservation programs and can be adopted without an associated cost.
Cost-effective analysis			
Water survey for single-family and multi-family customers			
Water conservation pricing		✓	Rather than uniform volumetric rates, consider this BMP that utilizes increasing block rates, seasonal rates, or excess use rates in addition to the base charges.
Wholesale agency assistance programs			
Metering of all new connections and retrofit of existing connections	✓		
System water audit and water loss control	✓		
Athletic field conservation			
Golf course conservation			
Landscape irrigation conservation and incentives	✓		
Park conservation			
Residential landscape irrigation evaluation			
Public information	✓		
School education	✓		
Small utility outreach and education			
Partnerships with nonprofit organizations		✓	Partnering with organizations like the Efficiency County AgriLife Extension office and its Master Gardener program can help provide additional conservation education and outreach to your customers.
Conservation programs for industrial, commercial, and institutional accounts		✓	This BMP can help advance conservation goals and address high water use, especially since commercial accounts (more specifically, the housing authority, multi-family apartment complexes, and the school) have been identified as the 5 highest users in the city.

Evaluation of Best Management Practices

Residential clothes washer incentive program	✓		
Showerhead, aerator, and toilet flapper retrofit	✓		This program is discussed in the water conservation plan but only regarding severe or prolonged water shortages. Implementing this BMP, even during times of plentiful water, can assist in conserving water and meeting water-use goals prior to entering severe water shortages.
Toilet replacement programs			
Water wise landscape design and conversion programs			
New construction graywater			
Industrial, commercial, and institutional incentive programs			
Rainwater harvesting and condensate reuse			
Water reuse			
Prohibition on wasting water		✓	This BMP can be beneficial for saving water, as well as public awareness, and can be adopted without an associated cost.

BMP – best management practice
WCP – water conservation plan

Please refer to the TWDB's *Municipal Best Management Practices Guide*, found at <http://www.twdb.texas.gov/conservation/BMPs/Mun/index>, for additional information about each BMP.

Appendix C

Sample utility evaluation letter

Evaluation of Best Management Practices

May 29, 2018

The Honorable Watersaver
Mayor of Good Waters
P.O. Box 777
Good Waters, TX 77700

Dear Honorable Watersaver:

The City of Good Waters (city) recently applied for financial assistance from the Texas Water Development Board (TWDB). As part of that application, you submitted a water conservation plan for the city that includes 5- and 10-year goals for total water use, residential water use, and water loss in gallons per capita per day. The city's water conservation plan should outline how it plans to achieve those goals through different water conservation activities and the use of water conservation best management practices, as appropriate.

When reviewing the city's water conservation plan, TWDB conservation staff has also evaluated the plan for use of best management practices in the TWDB's *Best Management Practices Guide*. Enclosed with this letter is a table showing the best management practices that TWDB conservation staff has identified in the city's water conservation plan, along with best management practices the city may want to consider when revising its water conservation plan in the future. Also enclosed is the conservation review sheet prepared by TWDB staff as part of the application approval process.

The TWDB's *Municipal Best Management Practices Guide* can be found at <http://www.twdb.texas.gov/conservation/BMPs/Mun/index.asp>. The guide is a great resource when reviewing potential water conservation activities for implementation.

If you have any questions regarding this evaluation, your water conservation plan, or TWDB's best management practices, please feel free to contact Mr. John Sutton of our Municipal Conservation staff at 512-463-7988 or john.sutton@twdb.texas.gov. Thank you for your interest in conserving Texas' most precious resource: water.

Respectfully,

John T. Dupnik, P.G.
Deputy Executive Administrator
Water Science and Conservation

Enclosures