U.S. Environmental Protection Agency
Water Conservation Plan Guidelines

PART 3
BASIC GUIDELINES FOR PREPARING WATER CONSERVATION PLANS

These Basic Guidelines are designed for use by water systems serving populations of 10,000 or fewer. Some water systems, especially those serving fewer than 3,300 people, may be included in a Capacity-Development Approach, which addresses water conservation through state capacity-development strategies required by the SDWA. (See Section 5 of Part 1.) Systems should check with their state primacy agency for information and guidance about capacity development.

Which Guidelines are appropriate also may depend on various factors and conditions affecting water systems and their need for conservation planning. For example, smaller systems with constrained water supply resources may want to follow the Intermediate Guidelines. *Water system managers should check with their own state's rules, regulations, and recommendations about which Guidelines to follow.*

1. Specify Conservation Planning Goals

Planning Goals

Specify conservation planning goals in terms of expected benefits for the water system and its customers. Involve affected members of the community in the development of conservation planning goals and throughout the implementation process.

Planning goals can be developed from different perspectives. These Guidelines emphasize a water supplier perspective. Lowering water demand can help water suppliers avoid, downsize or postpone the construction and operation of supply-side facilities.

Customers and society at large also benefit from conservation. Conservation benefits society by preserving environmental resources. Conservation can benefit customers by lowering energy and long-term water costs. Water conservation reduces demands on wastewater systems; in fact, the need to reduce wastewater treatment costs can be a strong rationale for water conservation. The Guidelines and the worksheets can be used to simultaneously address the potential effects of conservation on water and wastewater operations.

Water systems should state their goals in specific terms. Measurable goals are useful for evaluation purposes. For example, many water systems identify a specific water-use reduction goal (as a percentage of current water usage). Water conservation planning goals may include:

- Eliminating, downsizing, or postponing the need for capital projects.
- Improving the utilization and extending the life of existing facilities.
- Lowering variable operating costs.
- Avoiding new source development costs.
- Improving drought or emergency preparedness.
- Educating customers about the value of water.
- Improving reliability and margins of safe and dependable yields.
- Protecting and preserving environmental resources.

Managers should revisit the goals section before finalizing the conservation plan and periodically thereafter, because goals and the means to achieve them will evolve. As the water system accomplishes certain conservation goals, new objectives may emerge.

Community Involvement

The process of developing goals should involve community representation. Modern resource planning emphasizes an open process that gives all affected groups an opportunity to express their interests and concerns. Involving the community in goal development and implementation also serves an important public education function, and can greatly enhance

the success of conservation programs. Members of the community who might be interested in water conservation include:

- Residential water consumers
- Commercial water consumers
- Industrial water consumers
- Wholesale customers
- Environmental groups
- Civil rights groups
- Indian tribes
- Labor groups
- Business and commerce groups
- Recreational water users
- Agricultural users
- Educational institutions
- Government agencies

In addition to helping the water system specify planning goals, community participants also may have an ongoing role in a system's conservation program. Ongoing involvement helps maintain and build support for achieving conservation goals and "getting the word out" about the conservation effort. Participants can act as a focus group for exploring specific conservation measures (discussed in Section 4), and also can provide valuable linkages to key groups—consumers, businesses, and institutions—involved in implementing certain conservation measures. Participants also can offer input on the level of satisfaction with the system's programs. Finally, community groups can assist the water system in monitoring results and adjusting program implementation.

For many water systems, involving the community in water system planning will be a new experience. Community involvement does not have to consume excessive time or resources. Even a few "town hall" meetings or "brainstorming" sessions can be helpful. Most system managers will find that involving members of the community in developing goals, implementing programs, and evaluating results is a very worthwhile investment. Fortunately, guidance on this approach is available.[1]

[1] See *Public Involvement Strategies: A Manager's Handbook* (Denver, CO: American Water Works Association Research Foundation, 1996).

2. DEVELOP A WATER SYSTEM PROFILE

Summarize the service and operating characteristics of the water system. Provide an overview of conditions and a description of climate, water availability, or other factors that might affect water conservation planning.

Developing a system profile by taking inventory of existing resources and conditions helps systems assess their present circumstances and design strategies to meet emerging needs. Most systems should maintain the information necessary for building a profile. Much information may already have been compiled for a facility plan or for other purposes.

Systems can use Worksheet 3-1 to compile and present a system profile. The profile may be expanded to include additional information, for example, data on trends for some characteristics (such as supply and demand measures) that help describe the system. The first part of the worksheet lists system characteristics.

The second part of the worksheet provides an overview of conditions that might affect the conservation planning effort. This checklist can be used to review conditions affecting the supply or demand for water, focusing on conditions that most affect your system. The conditions outlined in the worksheet suggest the need for water conservation planning. While all water systems can benefit from efficiency improvements, water conservation is especially beneficial for systems experiencing water shortages or rapid increases in demand.

For some conditions, states might provide benchmark measures that water systems can use for comparison purposes. For example, a state might have specific criteria for defining critical use or stressed areas, for classifying per-capita water use, or for identifying the age of systems. Systems should try to compare significant conditions using generally accepted measures.

The last part of the worksheet is provided so that water systems can describe their current water conservation activities and programs.

Worksheet 3-1: Water System Profile

SUMMARIZE SYSTEM CHARACTERISTICS

A	SERVICE CHARACTERISTICS	Number		
1	Estimated service population			
2	Estimated service area (square miles)			
B	**ANNUAL WATER SUPPLY**		**Annual volume**	**Percent metered**
3	Total annual water supply			%
C	**SERVICE CONNECTIONS**		**Connections**	**Percent metered**
4	Residential, single-family			%
5	Other			%
6	Total connections			%
C	**WATER DEMAND**	**Annual volume**	**Percent of total**	**Per connection**
7	Metered residential sales			
8	Metered nonresidential sales			
9	Other metered sales			
10	Unmetered sales			
11	Nonaccount water [a]			
12	Total system demand (total use)			
D	**AVERAGE & PEAK DEMAND**	**Volume**	**Total supply capacity**	**Percent of total capacity**
13	Average-day demand			%
14	Maximum-day demand			%
F	**PRICING**	**Rate structure [b]**	**Metering schedule [c]**	**Billing schedule [c]**
15	Residential rate			
16	Nonresidential rate			
17	Other rate			
G	**PLANNING**	**Prepared a plan ☑**	**Date**	**Filed with state ☑**
18	Capital, facility, or supply plan			
19	Drought or emergency plan			
20	Water conservation plan			

(Worksheet continues)

Worksheet 3-1 (continued)

SUMMARIZE SYSTEM CONDITIONS

H	PLANNING QUESTIONS	Yes	No	Comment
21	Is the system in a designated critical water supply area?			
22	Does the system experience frequency shortages or supply emergencies?			
23	Does the system have substantial unaccounted-for and lost water?			
24	Is the system experiencing a high rate of population and/or demand growth?			
25	Is the system planning substantial improvements or additions?			

SUMMARIZE CURRENT CONSERVATION ACTIVITIES

Water conservation measures	*Approximate* annual water savings [if known]	Implemented since (date)	Is continued implementation planned?

[a] Nonaccount water is water not metered and sold to customers (including authorized and unauthorized uses). See Appendix A, figure A-7 and Worksheet A-2.
[b] Uniform, increasing-block, decreasing-block, seasonal, or other.
[c] Quarterly, monthly, or other.

3. PREPARE A DEMAND FORECAST

Forecasting water use (or demand) can range from simple projections based on anticipated population growth to complex models. Forecasts can be made for the water system as a whole; however, forecasts are more accurate when they are prepared for separate classifications of water use.

Prepare a forecast of anticipated water demand for selected time periods. To the extent practical, the planner should take into account variations in demand based on type of water usage, as well as perform a "what if" (sensitivity) analysis.

Prepare forecasts for five-year and ten-year time points. Additional time points can be used as well. The longer the planning horizon, the greater will be the uncertainty of the forecast. Forecasts should be revisited and updated on a regular basis.

The demand forecast should recognize the effects of conservation measures already implemented. However, for the purposes of this conservation plan, anticipated demand effects from measures contemplated in the plan should not be included.

This section of the plan is optional if the population served by the water system is not growing at a rate of more than 2 percent per year (or another population-growth benchmark specified by the state). Additionally, it is not necessary for systems to prepare a separate forecast for the purposes of this plan if a forecast has already been prepared for the system within the suggested time frame. Managers should include the results of such forecasts in this plan.

Worksheet 3-2 provides a simple water demand forecasting methodology based on population. This method is reasonable for water systems that have little variation within their service populations (such as systems that serve only single-family residential customers in comparable housing) and stable water-use characteristics. The method calculates per capita water use and multiplies the result by projected population levels. Projected water use is compared to system capacity to calculate the anticipated surplus or shortage. Any adjustments to the forecasts for known and measurable factors that might affect demand should be explained. Worksheet 3-2 also provides a method for estimating average-day and maximum-day demand.

An alternative to calculating water use on a per-capita basis is to calculate water use on a per-connection (or per-household) basis. (Managers often use the median number of persons per household to make conversions.) For forecasting purposes, per-connection water use is multiplied by the number of current and projected connections (such as residential households). It may be easier to project households based on land-use planning data and construction estimates.

Care should be taken in using the per-capita or per-connection approach to forecasting, particularly if the service population is varied. Separate forecasts should be prepared for large-volume water users (such as a large industrial plant). When one large-volume user begins, changes, or terminates service from a relatively small utility, the effects can be felt throughout the utility's operations. Plant managers can be consulted about projected water needs for the industrial sector.

The per-capita and per-connection methods of forecasting have limitations. They assume that water use is essentially a function of population or changes in the number of connections and that usage patterns will not change with time. For example, customers are not expected to install water-saving fixtures or respond to future changes in rates. For this reason, managers should include a brief assessment of factors that could affect the level or pattern of demand in their service territory.

Worksheet 3-2: Water Demand Forecast [a]

Line	Item	Current Year	5-Year Forecast	10-Year Forecast
A	**TOTAL ANNUAL WATER DEMAND**			
1	Current total annual water demand (from Worksheet 3-1) [a]			
2	Current population served [b]			
3	Total water demand per capita (line 1 divided by line 2) [b]			
4	Projected population [b]			
5	Projected total annual water demand (line 3 multiplied by line 4)			
6	Adjustments to forecast (+ or -) [c]			
7	Adjusted total annual water demand (line 5 plus line 6)			
8	Current annual demand (line 1) and adjusted annual water demand forecast (line 7 for forecast years)			
9	Current and projected annual supply capacity (from Worksheet 3-1) [d]			
10	Difference between total annual water demand and total annual supply capacity (+ or -) (subtract line 8 from line 9)			
B	**AVERAGE-DAY AND MAXIMUM-DAY DEMAND**			
11	Current and forecast average-day demand (line 8 divided by 365)			
12	Current maximum-day demand (from Worksheet 3-1)			
13	Maximum-day to average-day demand ratio (line 12 divided by line 11)			
14	Projected maximum-day demand (line 13 multiplied by line 11 for all forecast years)			
15	Adjustment to maximum-day demand forecast [c]			
16	Current (line 12) and adjusted maximum-day demand forecast (add lines 14 and 15)			
17	Daily supply capacity (line 9 divided by 365)			
18	Ratio of maximum-day demand to daily supply capacity (line 16 divided by line 17)			

[a] Separate forecasts should be prepared for large-volume users, as well as for nonaccount water (water not billed to customers) if nonaccount water is a significant amount (such as more than 10 percent of total production).

[b] Managers can use connections instead of population and per-connection water use instead of per-capita water use.

[c] Please explain adjustments to your forecast (lines 6 and 15), including effects of installed conservation measures and rate changes.

[d] Supply capacity should take into account available supplies (permits), treatment capacity, or distribution system capacity and reflect the practical total supply capacity of the system, including purchased water.

4. IDENTIFY AND EVALUATE CONSERVATION MEASURES

Conservation Measures

Identify the conservation measures that have been implemented, are planned, or are not planned. Provide an explanation for why recommended measures are not planned for the water system. For each measure chosen, estimate total implementation costs (dollars) and anticipated water savings (volume) and assess the cost effectiveness of the measure.

Water systems have a wide selection of specific conservation measures at their disposal. These measures include both supply-side and demand-side management techniques for saving water, and range from relatively simple educational tools to advanced water-efficient technologies. Use of any particular measure depends on whether it meets cost-effectiveness and other planning criteria and whether its use complies with applicable laws and regulations, including state and local plumbing codes.

The conservation measures identified in Table 2-3 of the Overview are organized into three levels: Level 1, Level 2, and Level 3. Each level includes four categories of measures. Specific water conservation measures are identified within each category. The number of specific measures included in each level expands from the Basic to the Intermediate and from the Intermediate to the Advanced Guidelines. In other words, the measures are cumulative. *Appendix A provides additional information and several worksheets on the conservation measures.*

All water systems, regardless of their size or the conditions under which they operate, should consider the very fundamental and widely accepted practices identified under Level 1. The measures in Levels 2 and 3 generally are considered appropriate for systems with significant conservation needs and interests. Managers are encouraged to explore the full range of potential conservation measures for their systems. Many systems will find it beneficial to expand their conservation programs beyond the minimum set of measures.

Review of Measures

The minimum list of measures recommended for consideration appears in Worksheet 3-4. Systems should use the checklist to review and summarize the measures that are currently implemented, planned, or not planned at this time. Managers also can identify additional measures and practices as they develop their conservation plans

Measures should be selected on the basis of how well they can help the system achieve water savings, program costs, and other factors that are important to the water system. The planning document should discuss the criteria used in selecting the conservation measures and provide a summary of the results in terms of the measures planned for actual implementation.

The first step in the selection process is to identify criteria for evaluating the conservation measures. The cost-effectiveness of the measures is one criterion, but other factors should be considered as well. Managers are free to consider as many selection criteria as they believe are appropriate, but the relevance of the criteria should be explained in the conservation plan. The criteria that can be used in selecting conservation measures for implementation may include:

- Program costs
- Cost-effectiveness
- Ease of implementation
- Budgetary considerations
- Staff resources and capability
- Environmental impacts
- Ratepayer impacts
- Environmental and social justice
- Water rights and permits
- Legal issues or constraints
- Regulatory approvals
- Public acceptance
- Timeliness of savings
- Consistency with other programs

For each selection criterion, managers should identify whether, how, and why the factor affects the feasibility of implementing one or more conservation measures. Some factors might be more important than others. Planners also may want to bear in mind that techniques can be used to mitigate adverse effects and improve acceptance of measures. A cost-effective conservation measure should not be dismissed without careful consideration of how barriers to implementation might be overcome.

Budget

Developing a budget for each conservation measure is an invaluable part of the planning process. A simplified *cost-effectiveness* analysis can also be used to compare alternative conservation measures in terms of dollars per gallon of water saved. For example, one measure might produce savings at the rate of $.25/1,000 gallons while another produces savings at a cost of $.50/1,000 gallons.

Worksheet 3-3 should be completed for *each* planned conservation measure. In some cases, managers may want to combine measures based on the conservation program they envision. *All interrelated measures that are expected to result in an identifiable amount of water savings should be combined and treated as one measure in order to avoid counting the planned water savings more than once in the analysis.*

Worksheet 3-3 begins with an open-ended description of the measure. The anticipated life span for the measure should be indicated. Managers also should indicate whether the measure is targeted toward reduction in average-day demand, maximum-day demand, or both. A method for summing the total budget needed for implementing the measure is provided. All costs associated with implementation should be included. Managers should ascertain reasonable cost estimates by potential vendors whenever possible. Several different types of costs as indicated on the worksheet should be analyzed. When estimating costs, a realistic

implementation schedule should be considered. Any special circumstances affecting the schedule or cost of implementing the proposed measures should be discussed in the plan.

Worksheet 3-3 also includes a method for estimating annual water savings and total life-span savings that can be achieved by the measures. For each measure, the method used to calculate anticipated water savings should be provided. This might include, for example, a formula for converting daily per capita savings to annual savings. In some cases (such as a leakage control program), it might not be feasible to estimate savings for each unit, in which case total annual savings for the entire measure are sufficient. Cost per gallon of water saved can be used to compare conservation measures and to compare conservation to supply-side options.

If a system chooses not to implement any of the minimum measures, a complete explanation should be provided in the plan. If perceived costs and benefits are among the reasons for rejecting a measure a supporting analysis should be provided. This analysis can be based on a comparison of implementation costs to the system's average annual cost of production (or revenue requirements). Planners can consult the Intermediate Guidelines for more information about benefit-cost and cost-effectiveness analysis.

Conservation measures that affect the demand side of the water system have the effect of reducing water sales and utility revenues usually are a function of the quantity of water sold and the rate charge (per unit of water sold). Because revenue sufficiency plays an important role in ensuring the capacity of the water system, managers should consider conservation effects on revenues. The conservation plan should briefly address how planned conservation measures will affect water utility revenues (based on reduction in sales) and discuss strategies for addressing these revenue effects.

Summary

The plan should summarize and describe in general terms the range of conservation measures planned for implementation and the anticipated benefits, including effects on planned capital facility projects (if applicable). Measures planned for implementation can include Level 2 and Level 3 measures. The plan should discuss whether conservation can help the system avoid, downsize, or defer capital expenditures. The Intermediate Guidelines also provide some guidance on this issue.

The process of selecting measures can be summarized in Worksheet 3-4. For each recommended measure, managers should indicate whether the measure was selected for implementation. Managers also should identify the primary reason or reasons for selecting or rejecting the measure. Special conditions or actions that are required before a selected measure can be implemented (such as an approval from regulators) should be noted. In some cases, managers may conclude that a measure (or measures) cannot be implemented because of a constraint that exists in the short term. Conservation measures that might be planned for future implementation, once constraints are resolved, should be discussed in the plan.

Worksheet 3-3: Budget and Savings for Each Conservation Measure

Describe planned conservation measure:

_____
_____
_____
_____

Typical water savings from the measure: _____ per _____
Number of planned installations: _____
Anticipated life span for the measure: _____ years

The measure is designed to reduce:
- ❒ Average-day demand
- ❒ Maximum-day demand
- ❒ Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	**BUDGET FOR EACH MEASURE [a]**	**Per unit [b]**	**Total cost of the measure**
1	Materials	$	$
2	Labor		
3	Rebates or other payments		
4	Marketing and advertising		
5	Administration		
6	Consulting or contracting		
7	Other		
8	Total program cost for the life of the measure (add lines 1 through 7) [c]		$
B	**TOTAL SAVINGS**		
9	Number of units to be installed [d]		
10	Anticipated annual water savings per unit in gallons [e]		
11	Total annual savings for the measure in gallons (multiply line 9 by line 10)		
12	Expected life span for the measure in years		
13	Total life span savings for the measure in gallons (multiply line 11 by line 12)		
14	Cost per gallon of water saved (divide line 8 by line 13)		$ /gallon

[a] A separate analysis should be performed for each conservation measure, but measures can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure, in which case total program water savings and costs for the measure can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. See Appendix B for benchmarks and sample calculations. Leave blank if unit values do not apply.

Worksheet 3-4: Selection of Conservation Measures

Line	Measure	Already implemented ☑	Plan to implement ☑	Primary criteria for selecting or rejecting the conservation measure for implementation [a]
Universal metering [B]				
1	Source-water metering			
2	Service-connection metering			
3	Meter public-use water			
Water accounting and loss control [A]				
4	Account for water			
5	Repair known leaks			
Costing and pricing [B]				
6	Cost-of-service accounting			
7	User charges			
8	Metered rates			
Information and education [B]				
9	Understandable water bill			
10	Information available			
Other Measures [b]				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20…				

[a] This space may also be used to note special issues related to this measure, including legal or obstacles to its use that preclude further consideration.

[b] See Appendix A for additional information on water conservation measures.

[A] = measure affects average-day demand

[P] = measure affects maximum-day (peak) demand)

[B] = measure affects average and peak demand

5. Present Implementation Strategy

In this final step in the conservation planning process, the water system specifies its strategy and timetable for implementation. It can be emphasized, however, that conservation planning will require an *ongoing* effort on the part of water utility managers. Ongoing planning and implementation will go hand in hand.

Present a strategy and timetable for implementing and assessing conservation measures and other elements of the conservation plan.

In the implementation strategy, managers should make note of any specific factors or contingencies that might affect or prevent the implementation of specific measures. For example, if a measure cannot be implemented prior to obtaining a special permit or other authority, this fact should be noted along with an explanation of the strategy for obtaining the necessary authority. Some measures might require implementation actions that take place over several years (in order to sustain conservation savings). The plan should provide sufficient detail to understand the utility's strategy with regard to implementing such measures.

Worksheet 3-5 is a simple template for summarizing the water system's implementation and evaluation strategy for the conservation plan. A plan for public involvement should discuss how and when the water system intends to involve members of the community in the development and implementation of the conservation plan. Systems may want to plan regular communications (meetings and mailings) with community groups to keep them informed of the system's progress in meeting goals.

A plan for monitoring and evaluation should address data collection, modeling, and other issues that will be important in tracking the effects of water conservation on demand over time. The system may want to collect new kinds of data for monitoring purposes as well as for future forecasting needs. Many systems might find, for example, that more detailed data on demand by customer class are needed, including more detail on contributions to average-day and maximum-day demands. More detailed data might also be needed to assess trends in nonaccount water.

A plan for updates and revisions will help keep the system's conservation plan current over time and account for the system's actual experience with conservation. Updating forecasts of water demand and supply capacity as new data become available is especially important. In some cases, the system might want to revise or expand its planning goals. Many systems update plans every five years. However, changing conditions or other concerns might justify more frequent updates. The schedule of updates and revisions might be affected by state or local requirements for conservation planning by the water system.

The conservation planning document also should include a record of the plan's adoption by the water system's governing body (such as a Board of Directors or City Council), as appropriate.

Worksheet 3-5: Implementation Strategy

A. PUBLIC INVOLVEMENT

Describe plan for public involvement:

_____
_____
_____
_____
_____
_____
_____

B. MONITORING AND EVALUATION

Describe plan for monitoring and evaluation:

_____
_____
_____

Describe plan to collect water demand data:

_____
_____
_____

C. PLAN UPDATES

Describe plan for updates and revisions:

_____
_____
_____
_____
_____
_____
_____

D. ADOPTION OF THE PLAN

Date plan completed: _____
Date plan approved: _____
Approved by [governing body]: _____
Signature: _____

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