

Developing a Water Management Plan: 6 Steps for Facility Managers

This step-by-step process for developing a water management plan will help facility managers improve water conservation awareness and water-use efficiency in their facility.

The Process at a Glance:

- STEP 1: Get a commitment from top decision makers to support improvements in water-use efficiency.
- STEP 2: Determine annual water use, calculate water and water-related energy costs.
- STEP 3: Complete a water audit.
- STEP 4: Establish a water budget for the facility and landscaping.
- STEP 5: Create an employee or student awareness program.
- STEP 6: Write and distribute the water management plan.

STEP 1: GET A COMMITMENT FROM TOP DECISION MAKERS TO SUPPORT IMPROVEMENTS IN WATER-USE EFFICIENCY

It is crucial that top management (e.g. the building manager or owner, school district superintendent, etc.) supports the water management plan both ideologically and financially. There must be support and a genuine desire to improve water-use efficiency from management in order to implement an effective plan. Water-use efficiency must be seen as a long-term investment.

Why should all facilities, including businesses, hospitals and school districts, support improvements to water-use efficiency?

- **FOR THE GOOD OF THE COMMUNITY:** When a sufficient number of companies, facilities and school districts within a community participate in water-use efficiency improvements, water supplies are preserved, which can forestall or negate costs associated with expanding water distribution and/or water and sewage treatment facilities.
- **TO REDUCE FACILITY OPERATING COSTS:** Implementation of an aggressive water efficiency plan should result in reduced costs for water, sewage, chemical treatment and energy.
- **TO IMPROVE EFFICIENCY:** A water management plan will assist in predicting and budgeting for facility and equipment maintenance, facility upgrades, equipment replacement costs and utility costs.
- **TO IMPROVE PUBLIC RELATIONS:** Implementation of a water-efficiency program can be one positive way to improve community relations by enhancing the perception of environmental responsibility.

Once support from management is obtained, distribute a written policy statement about management's commitment to water-use-efficiency to employees, occupants, students, etc. Because this statement will reflect management's intentions, it will be different for every entity.

Example:

"We encourage employees (or teachers, staff and students) to embrace water-use efficiency as a way of life, not only at work (school), but also at home. To this end, (the company, school district) is committed to developing and maintaining a comprehensive program to manage water use efficiently, which will ensure our continued ability to grow, reduce operational costs and promote our environmental ethic."

STEP 2: DETERMINE ANNUAL WATER USE, CALCULATE WATER COSTS AND WATER-RELATED ENERGY COSTS

Prior to writing a water management plan, the annual volume of facility water use must be calculated. The steps below explain how to calculate annual water use, costs, and water-related energy costs. It may be helpful to put together a team of staff (or student) volunteers, or assign tasks to facility maintenance and landscape staff to assist in this process:

- 1) Determine how water use is metered within the facility. Is interior and exterior water use metered separately? Are any water uses sub-metered? Are individual buildings metered separately? If not, estimating water use may be necessary. Another option is to use a portable ultrasonic water meter that clamps onto the outside of the pipes and uses ultrasound to measure flows at various points in the facility. This method could also be used to determine water use to individual buildings.
- 2) Collect and record water use for all meters for the past twelve months. Note the highest water use months for each meter. Record sub-metered volumes separately. To do this, it may be necessary to determine who receives and pays monthly water and utility bills. If water bills are paid off-site, request copies of water bills from the water provider.

Determine the Annual Water Use Volume – by adding up the volume of water used from 12 months of facility water bills for all meters.

Calculate Annual Water Costs - Use monthly bills or invoices to calculate the total cost of annual water use including water, * sewer, heating, treatment and disposal, and pumping. Divide this cost by the annual volumetric consumption to determine the real cost of water. Do not overlook seasonal cost such as summer surcharges and consumption variations (e.g. increased landscape water use, months with higher numbers of staff or students on site, etc.) that could impact the calculation.

*Separate sewage costs from water use costs if billed together. Note: sewage costs are calculated based on total water delivered to a facility unless supplies that are not returned to the sewer system are sub-metered (e.g. for irrigation use, or cooling tower make-up water). In some locations, sewage bill credits are available, check with the local wastewater treatment facility.

Calculate Annual Water-related Energy Costs - determine the annual energy cost of heating water. Natural gas and electric companies often offer assistance to customers in calculating these costs.

STEP 3: COMPLETE A WATER AUDIT

After calculating annual water use and costs, audit each facility to identify and inventory the specific types of water use, both indoors and outdoors, that comprise the total annual water use.

- 1) Locate owner's manuals for all water-using equipment for reference. Go on-line or call the manufacturer or installer for information on capacities, water use of appliances, equipment and, if applicable, manufacturing processes.
- 2) Calculate water use for all toilets, sinks, dishwashers, icemakers, cooling towers, refrigeration equipment, drinking fountains, and other fixtures, appliances and equipment. Use the [Facility Water Use: Checklist for Maintenance Staff](#) and [Worksheet: Inventory of Facility Water Use](#) to record various daily water uses. Consultants can be hired to assist with the audit, if necessary.
- 3) Summarize total landscape water use. If there is no landscape meter, estimate landscape water use by subtracting the estimated indoor use (using winter water bills from months with little or no landscape irrigation) from total water consumption. If landscaping is extensive, use a portable ultrasonic water meter. Or, calculate the volume of water being applied per valve under the current irrigation schedule by using the [Volume Based Irrigation Audit Worksheet](#) and [Instructions](#). Ultimately, it may be cost-effective to install a landscape meter to help manage and track exterior water use on a permanent basis.
- 4) Compare the estimates of indoor and outdoor water consumption with water bills to see if the estimates are accurate. If there are large disparities between the two, re-evaluate the calculations and assumptions until disparities are resolved.
- 5) Evaluate the use of energy-efficient equipment in buildings. If waste heat generated by equipment, computers, lights, and people is not vented outside the occupant areas, the increases in heat load normally removed by central HVAC systems or cooling towers will result in higher energy and water use.
- 6) To help prioritize improvements, consider breaking down water use and water related energy use and users in more detail. This includes demographic information such as the number of individuals, gender distribution, and work or occupancy schedule. Note fluctuations in use, for example weekend use or non-use, school hours-summer school versus the regular school year. Restaurants should determine which times of day, year and specific holidays have higher table turns or increases in banquets and catering, as this will affect seasonal water use patterns. Factors such as length of shifts and gender are important because they may impact water-efficiency options. For example, in women's restrooms that have toilets with one flush volume, dual flush toilets could be installed, whereas men's rooms have both toilets and urinals, therefore, lower or no volume options. For that reason, a higher use public ladies restroom may take priority over an employee restroom, or men's room.

STEP 4: ESTABLISH A WATER BUDGET

Once the approximate volume of water use is known, compare the amount being used to what is actually necessary for proper facility operations. Refer back to equipment operation and maintenance manuals, worksheets, or other similar literature to determine appropriate equipment flow rates.

Budget for the facility -

- 1) Check for water that flows needlessly on off days, during down time, or when equipment is on "standby." Note and list out these areas that need improvements.
- 2) Identify where reductions in water use will occur, and project how much water will be saved.
- 3) Document ways to reduce water consumption. Use the [Implementing a Water Management Plan: Checklist for Managers](#) and [ADWR Conservation website](#) for information on how to reduce indoor and outdoor water use.

Budget for facility's landscape -


- 1) Budget should be based on the irrigated area, type of plants, and actual plant water demand based on historic weather rainfall data and evapotranspiration rate (ET_o).
- 2) For assistance in developing a water budget, contact your local [Cooperative Extension Office](#), or a local certified irrigation auditor. For a list of certified auditors contact your local water provider or the [Irrigation Association](#).

STEP 5: CREATE AN EMPLOYEE OR STUDENT AWARENESS PROGRAM

To be successful and to gain their support, employees and students need to be aware of the facility's water management plan and its goals. Develop a program to recognize staff or students for using water efficiently. An awareness program must include incentives (no matter how small) to be effective. To build awareness and support of the plan:

- 1) Inform all employees or students of management's (or school district) goals to increase the facility's water-use efficiency.
- 2) Ask for suggestions and provide opportunities for them to be engaged in the process and part of the solution. Ask employees or students to submit ideas for a catchy slogan and internal marketing campaign to help create ownership and draw attention to the plan, perhaps through a contest. In schools, the savings could be reinvested in facility, lab, or technology improvements (e.g. buying equipment, computers, etc.), or a special project the teachers and students want to accomplish that furthers water efficiency goals.
- 3) Conduct regular staff meetings to provide updates regarding the water management plan and water savings.
- 4) Designate a responsible person, team of staff members or students, and establish a reporting system for leaking faucets, toilets, sprinkler heads and other forms of water waste. In school environments, conducting annual water audits could be learning experiences for teachers and students.

Report on water, dollar and chemical savings figures regularly. Determine the most effective way to communicate information about the water management plan, activities, progress, and successes. Use website, blogs, twitter, email, bulletins, newsletters, paycheck stuffers, staff meetings, student assemblies, employee or school newsletters or bulletin boards in the employee break room or cafeteria. Highlight different aspects of water use: landscaping, low-flow plumbing fixtures, water-use habits, etc. Challenge them to commit to changing wasteful behaviors (e.g. shorter showers, fixing leaks, changing their irrigation schedule seasonally, etc.) Other ideas:

- Look for opportunities to provide brochures or fact sheets on water-use efficiency. Offer home water-saving devices to employees and students for free or at cost. Sponsor demonstrations of these devices by suppliers of this type of hardware. Have nurseries, cooperative extension agents, or local water conservation staff set up displays of low-water-use plants, irrigation technologies, give lectures or demonstrate water harvesting techniques, and answer questions. There are materials available on a variety of subjects from the ADWR offices throughout the state, the [ADWR Conservation website](#), or local water providers. ADWR's [Water Conservation Tips for Arizona Residents](#)  (72 KB) provides ideas for saving water.
- Invite guest speakers from local water conservation organizations, water provider or government conservation staff, to give presentations and/or demonstrations on water supply, the hydrologic cycle, water conservation tips, etc.

STEP 6: WRITE AND DISTRIBUTE THE WATER MANAGEMENT PLAN

The water management plan is an expansion of the policy statement. It should describe:

- how and where to use water more efficiently,
 - the amount of water to be saved,
 - information on employee or student awareness,
 - ways to publicize successes, and
 - plan review.
- 1) Review the results of the facility and landscape audits, and, as applicable, the information on the various worksheets provided.
 - 2) Identify the most excessive uses of water and list the actions which will save the most water with a reasonable "payback period". The payback period is the timeframe in which the action pays for itself in water, sewer, or other types of savings. Aim for those with a payback period of less than two years. Also look for ways to reuse or recycle water within the operational processes at the facility.
 - 3) List water and energy use reduction goals that are specific, achievable and measurable either by gallons or by a percentage. Identify where the reductions will be achieved (in what areas of the facility) by what means, and in what time frame. For example, set a goal to reduce cooling tower water consumption by 20%, or identify and fix all plumbing leaks, institute a toilet replacement program, etc.
 - 4) Provide an explanation of each task with a cost-benefit analysis where applicable. Make sure that current or proposed rates are used when determining costs and benefits. High-cost tasks should be supported by cost-benefit analyses. Rank each task according to cost-effectiveness, starting with:
 - Immediate actions that are no cost or low-cost,

- Actions which require capital expenditure and,
- Actions which require water-use habit modification.

Examples:

Increase the cycles of concentration in cooling towers.

Explanation - The cooling tower is operating at a concentration ratio less than 6, therefore the treatment program needs to be modified to reduce bleed-off and increase cycles of concentration.

Replace toilets with more efficient HET toilets or convert or replace urinals with waterless models. Prior to replacing plumbing fixtures with low flow models, the facility's plumbing system needs to be evaluated to insure there will be sufficient water flows to prevent sewer pipe malfunction.

NOTE: Historically a number of plumbing products were marketed and installed (e.g. flow-restricting devices, toilet dams, etc.) to reduce the volume per flush. In some cases, these retrofit devices do not reduce water use because older fixtures (3.5 gpf or greater) do not operate properly with reduced flush volumes. If the facility is currently using one of these products, toilet operation should be examined in the audit to ensure that double flushing is not occurring. If double flushing is occurring, consider removing devices that reduce efficiency.

- 5) Describe how the plan will be implemented and include information on employee or student awareness. Designate a person or team to assume responsibility for plan implementation and employee or student awareness. The person(s) responsible for plan implementation must be familiar with the water budget and should review monthly bills to track progress, monetary savings, and water savings.
- 6) Include information on ways for the facility to publicize successes. When the water management plan yields significant water savings, the facility should publicize successes.

Examples:

Work with staff or students to write a press release that describes the efforts and accomplishments. Distribute this information to local media and post it on the facility website.

Create a display that describes the facility's water-saving practices. Locate the display in the lobby, the employee break room or cafeteria.

Make a presentation about the water management plan at pertinent meetings or write an article for a trade publication or local newspaper.

- 7) Determine and document how often the plan will be reviewed and updated (once or twice a year is suggested), and identify who will be responsible for these reviews and updates.

A viable plan evolves and is flexible. It should be systematically reviewed and revised, noting the appropriate actions that need to be taken.

Some things to consider when reviewing the water management plan:

- Has the water efficiency program resulted in measurable reductions in water use?
 - What efforts have not been successful? Why?
 - What changes or improvements could be implemented to improve success?
 - Have changes in operations related to water use led to new opportunities to improve water use efficiency or, created any problems?
- 8) Incorporate all of the components above and write the facility's water management plan.
 - 9) Distribute the water management plan developed for the facility to all employees.

Sources:

Tucson Water and Phoenix Water booklets, circa 1993;

New Hampshire Dept of Environmental Services Water Supply Engineering, Environmental Fact Sheet WD-WSEB-26-16, 2001

East Bay Municipal Utility District (EMUD) Watersmart Guidebook, A Water-Use Efficiency Plan Review Guide for New Businesses, 2008