WaterSense at Work

Getting Started With Water Management

1.2 Water Management Planning

Best Management Practices for Commercial and Institutional Facilities

EPA WaterSense

November 2023

WaterSense® is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the nation's water supply by transforming the market for water-efficient products, services, and practices.

WaterSense at Work is a compilation of water efficiency best management practices intended to help commercial and institutional facility owners and managers from multiple sectors understand and better manage their water use. It provides guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

An overview of the sections in *WaterSense at Work* is below. This document, covering water management planning, is part of **Section 1: Getting Started With Water Management**. The complete list of best management practices is available at www.epa.gov/watersense/best-management-practices. WaterSense has also developed worksheets to assist with water management planning and case studies that highlight successful water efficiency efforts of building owners and facility managers throughout the country, available at www.epa.gov/watersense/commercial-buildings.

- **Section 1. Getting Started With Water Management**
- **Section 2. Water Use Monitoring**
- **Section 3. Sanitary Fixtures and Equipment**
- **Section 4. Commercial Kitchen Equipment**
- **Section 5. Outdoor Water Use**
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This document is one section from *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* (EPA-832-F-23-003). Other sections can be downloaded from www.epa.gov/watersense/best-management-practices. Sections will be reviewed and periodically updated to reflect new information. The work was supported under contract 68HERC20D0026 with Eastern Research Group, Inc. (ERG).

Overview

Water management planning is the foundation for any successful water reduction effort. While plans focused on water efficiency can be created and maintained individually, there are benefits to evaluating and managing water more holistically within a building. Facilities should consider comprehensive water management planning that accounts for water quality and efficiency to support the health and safety of building occupants. It can enable facility managers and maintenance staff to combine efforts when operating and maintaining the building, such as including requirements to monitor equipment flow rates while also monitoring for water quality parameters. This is not only important for large and complex equipment such as cooling towers, but also in the maintenance of items such as plumbing fixtures.

A good water management plan is the first step a commercial or institutional facility owner or manager should undertake to achieve and sustain long-term water savings and effective water management. It should be facility- and equipment-specific. A good plan should also include contingencies and manage risk through monitoring and preventative maintenance. The plan should work in concert with other facility plans such as energy management, operations and maintenance, and emergency plans. Finally, it should conform to all local, state, and federal laws, regulations, and ordinances.

While water use and efficiency are the primary focus of this section, a comprehensive plan should include:

- Water efficiency.
- Water quality, safety, and risk management for building water systems.
- Drought and other emergency planning for water supply disruptions.
- Stormwater management.

Water management planning generally addresses efficiency and water use reductions in four areas:[1]

- Reducing water losses (e.g., leaks).

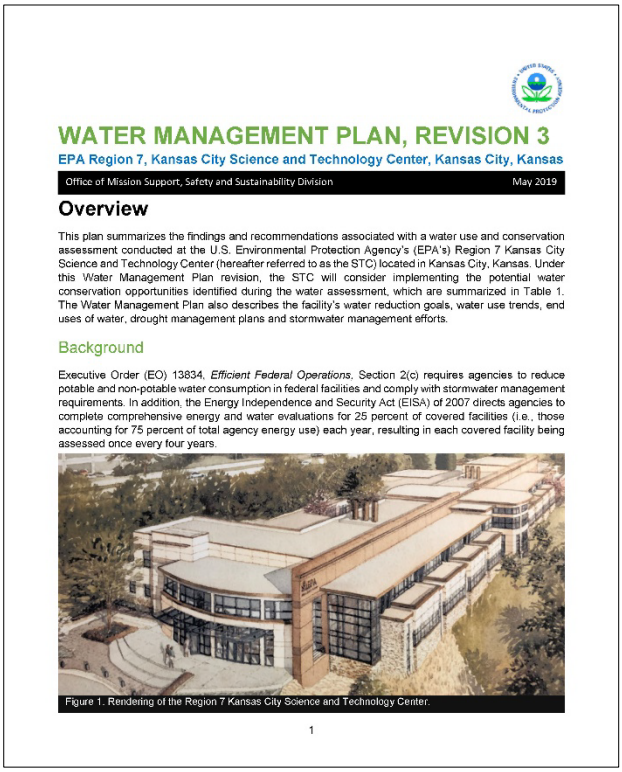
Comprehensive Water Management Planning

This section of *WaterSense at Work* suggests a holistic approach to planning for water management in a facility. Whereas some water management plans are focused solely on water efficiency, WaterSense encourages facilities to account for water quality, emergency planning, and stormwater management in one comprehensive plan.

[1] Arizona Municipal Water Users Association (AMWUA) Regional Water Conservation Committee and Black and Veatch. August 2008. *Facility Manager's Guide to Water Management Version 2.7*. Page 2. www.amwua.org/resource_documents/facility_managers_guide.pdf.

- Increasing and/or maintaining the water efficiency of fixtures, equipment, systems, and processes.
- Educating employees and occupants about water efficiency to encourage water-saving behaviors.
- Reusing onsite water that would otherwise be discarded or discharged to the sewer (e.g., reusing treated graywater or rainwater to water landscaped areas).

In addition to water use and efficiency, it is important to understand and address water quality and safety. Call-out boxes within this section highlight actions that can be taken to address water quality, safety, and risk management within building water systems.



WATER MANAGEMENT PLAN, REVISION 3

EPA Region 7, Kansas City Science and Technology Center, Kansas City, Kansas

Office of Mission Support, Safety and Sustainability Division May 2019

Overview

This plan summarizes the findings and recommendations associated with a water use and conservation assessment conducted at the U.S. Environmental Protection Agency's (EPA's) Region 7 Kansas City Science and Technology Center (hereafter referred to as the STC) located in Kansas City, Kansas. Under this Water Management Plan revision, the STC will consider implementing the potential water conservation opportunities identified during the water assessment, which are summarized in Table 1. The Water Management Plan also describes the facility's water reduction goals, water use trends, end uses of water, drought management plans and stormwater management efforts.

Background

Executive Order (EO) 13834, *Efficient Federal Operations*, Section 2(c) requires agencies to reduce potable and non-potable water consumption in federal facilities and comply with stormwater management requirements. In addition, the Energy Independence and Security Act (EISA) of 2007 directs agencies to complete comprehensive energy and water evaluations for 25 percent of covered facilities (i.e., those accounting for 75 percent of total agency energy use) each year, resulting in each covered facility being assessed once every four years.

Figure 1. Rendering of the Region 7 Kansas City Science and Technology Center.

1

First page of a water management plan for an EPA laboratory

Next, the water management team should also consider including water shortage and emergency contingency planning, which can be a stand-alone document or incorporated into the facility-specific comprehensive plan. The emergency contingency portion of the plan can help the team identify ways to prepare for and respond to short- or long-term drought, water restrictions, or complete water supply disruptions.

Finally, while not addressed in significant detail in this section, the last piece of a comprehensive plan involves managing stormwater to control runoff during and after rain events. Facilities should first ensure they are complying with all state and local stormwater management regulations. Potential considerations include those that can help improve air and water quality, provide habitat for wildlife, improve the aesthetics of the surrounding area, offer a peaceful outdoor sanctuary, and make the community more sustainable.[2] Stormwater management that incorporates green infrastructure practices can also reduce the need for irrigation or provide alternative water supplies for that purpose.

[2] U.S. Environmental Protection Agency (EPA). *Saving the Rain: Green Stormwater Solutions for Congregations*. www.epa.gov/sites/default/files/2020-06/documents/stormwatersolutionscongregations_508.pdf.

Creating the Water Management Plan

Effective water management planning can also be easily coupled with energy and waste management. The WaterSense program's approach to water management planning follows the same framework used in the *ENERGY STAR® Guidelines for Energy Management*,[3] and consists of these seven basic steps:

Step 1. Assemble your management team and make a commitment.
Step 2. Assess facility water use.
Step 3. Set and communicate goals.
Step 4. Create an action plan.
Step 5. Implement the action plan.
Step 6. Evaluate progress.
Step 7. Recognize achievement.

Step 1. Assemble Your Management Team and Make a Commitment

The relative success of any water management program hinges on the organization's long-term commitment to use water more efficiently and effectively. Commitment should come from all levels within an organization to ensure that appropriate water management goals are established and that continuous improvements are made. A champion can help provide guidance, maintain momentum, and infuse energy into project implementation. A champion often advocates for the improvements and celebrates successes to support additional water-saving projects in the future.

When an organization chooses to make a commitment to comprehensive water planning, it should consider the following:

- Form a dedicated water management team of staff and other professionals, including a team leader (i.e., champion) who is responsible for overseeing and implementing the water management program. Team members should include employees from all parts of the organization, including someone familiar with regulatory compliance and a facility or building manager with knowledge of the building's infrastructure and major mechanical systems. Where appropriate, include

Health Care Focus

For healthcare facilities, your water management team may also want to include:

- Staff who understand accreditation standards and licensing requirements.
- Staff with expertise in infection prevention and infectious diseases
- Risk and water quality management staff.
- Staff certified under *ASSE/IAPMO/ANSI 12080 Professional Qualifications Standard for Legionella Water Safety and Management Personnel*.

[3] ENERGY STAR. *ENERGY STAR Guidelines for Energy Management*. www.energystar.gov/buildings/tools-and-resources/energy-star-guidelines-energy-management.

consultants and contractors (e.g., water treatment professionals, irrigation contractors) since they play a direct role in water management.

- Develop a water management policy that provides the structure for establishing and achieving water management goals.
- Incorporate water management into long-term facility operation objectives and allocate the resources necessary to achieve goals.
- Integrate water management planning and goal tracking into company performance and sustainability reporting to elevate the importance of water efficiency and quality while maintaining accountability.
- Consider incorporating water efficiency policies and goals into the facility's environmental management system (EMS),[4] if one has been developed, and track progress on the goals through the EMS process.

Step 2. Assess Facility Water Use

Understanding how water is used within a facility is critical for the water management planning process. A water assessment provides a comprehensive account of all known water uses at the facility. It allows the water management team to establish a baseline from which progress and program success can be measured. It also enables the water management team to set achievable goals and identify and prioritize specific projects based on the relative savings opportunities and project cost effectiveness. Assessing facility water use and identifying water quality vulnerabilities incorporates the following steps:

- Gathering readily available information.
- Establishing a water use baseline.
- Inventorying major water-using fixtures, equipment, systems.
- Creating a facility water balance.
- Understanding equipment and systems that present a water safety risk (if included in the plan).

Gather Readily Available Information

The first steps in conducting an in-depth water assessment include: collecting any readily available information that can provide a basic understanding of building operational characteristics and general water use patterns; determining major uses of water within the facility; understanding how water moves through the building water systems; and estimating the costs of water use and sewer discharges. This information can be used to facilitate a more detailed investigation of facility water use and return on investment for any water efficiency-related projects.

[4] EPA. Environmental Management Systems (EMS). www.epa.gov/EMS/.

Develop an Understanding of Building Operational Characteristics

To better understand a facility's water use patterns, consider the following:

- Survey operations and maintenance personnel to determine typical facility operating conditions (e.g., hours of operation, number of employees and visitors) and building characteristics (e.g., size, number of floors). Document this information using a tool such as the Building Water Survey Worksheet provided on WaterSense's Tools for Commercial and Institutional (CI) Facilities web page at www.epa.gov/watersense/tools-ci-facilities.
- Determine how many days the facility is operating per year and when fluctuations in water use may be expected. Schools use less water during months when class is not in session; office buildings use less water on the weekends; and hospitals operating 24 hours per day, 365 days per year may see little daily or monthly variation.

Define How Water Is Used at the Facility

Once the water management team has a clear understanding of the facility's operational attributes and typical water use patterns, the next step is to determine specifically how water is used and currently tracked at the facility by doing the following:

- Identify all sources of water used at the facility (see definitions in the call-out box on the right). This can include: municipally supplied potable water or reclaimed water; wells or other freshwater sources; and onsite alternative water. For purposes of establishing a baseline, water

Types of Water Sources

Water sources can be defined as follows, based on the definitions developed by an interagency group working to implement requirements associated with a federal executive order on sustainability:

- **Potable water:** Water that is of sufficient quality for human consumption and that is obtained from public water systems or from natural freshwater sources, such as lakes, streams, and aquifers that are classified, permitted, and approved for human consumption.
- **Non-potable water:** Water that is obtained from natural freshwater sources that is not of sufficient quality for human consumption and has not been properly treated, permitted, or approved for human consumption.
- **Onsite alternative water:** Water that is not obtained from a surface water source, groundwater source, or purchased reclaimed water from a third party. It can include rainwater or stormwater harvested onsite, sump pump water harvesting, gray water, air cooling condensate, reject water from water purification systems, water reclaimed onsite, or water derived from other water reuse strategies.
- **Purchased reclaimed water:** Wastewater treatment plant effluent purchased from a third party that has been diverted for beneficial uses, such as irrigation, that substitute the use of an existing freshwater source.

sources can be more broadly grouped as potable, non-potable, onsite alternative, or purchased reclaimed water.

- Identify and record basic information for all metered sources and discharges (e.g., to the sewer or storm sewer) of water, including billing account numbers and meter numbers, size/type, and location. Also note whether meters are dedicated to specific end uses (e.g., irrigation, indoor water use). Document this information using a form such as the List of Water Meters Worksheet provided on WaterSense's Tools for CI Facilities web page at www.epa.gov/watersense/tools-ci-facilities. In addition, consider documenting and tracking water use information for each meter using ENERGY STAR Portfolio Manager.[5]

Dedicated irrigation water meter

- Identify sources of unmetered water use.
- Work with operation and maintenance personnel to identify any fixtures, equipment, systems, and processes that are submetered. If available, obtain copies of internal log books or electronic records of submetered water use.

If ongoing water use monitoring is not already occurring, assign someone to track meter and submeter water use at least monthly. *WaterSense at Work Section 2.1 Metering and Submetering* at www.epa.gov/watersense/best-management-practices has a more in-depth discussion about the use of meters and submeters in facilities.

Understand How Water Moves Through the Building Water System

Proper water management requires an understanding of how hot and cold water moves through and around the building. First, describe the path that water takes through the building using text, then create a process flow diagram to show how it is distributed. Be sure to include where specialized equipment such as fountains, pools, hot tubs, cooling towers, water heaters, boilers, and irrigation systems are located. An existing as-built diagram of the plumbing system and fixtures can help with this part of the process. Include where water enters the building, where cold water is distributed and heated, where hot water is distributed, and where water is discharged to the sewer system.

[5] ENERGY STAR. Portfolio Manager Overview. www.energystar.gov/buildings/benchmark.

Gather and Review Water Bills to Understand Use and Cost

Collect at least two years of water and sewer use data for the most recent timeframe possible for each identified source. This will help facility owners and managers better understand how much their facility's water use costs. These data can include records or logs from source water meters and/or utility water bills. If bills are delivered to and paid off-site, be sure to receive copies for tracking and evaluating costs. In addition, consider the following:

- Water bills usually contain several separate charges, which vary by utility. Some charges are fixed, whereas others are variable based on metered usage. Figure 1 on the next page provides an example bill with the charges specifically labeled. Water managers should contact the utility to clarify any questions before using the information to evaluate potential water use reductions and any associated cost savings. With accurate cost savings information, the water management team can prioritize water-saving project opportunities.
- In addition to gathering data for metered sources, gather information necessary to estimate annual water use for any unmetered sources of water, such as well water or other source water brought onsite. For example, water use may be estimated based on source water pumping rates or the consumption of the end uses supplied by the source.

Reviewing and analyzing water bills

Figure 1. Example Information on a Water Bill

City Water and Wastewater Bill

Bill Date: October 1, 2023
Due Date: November 1, 2023
Account Number: 987654-32

Customer Name: Facility XYZ
Service Address: 123 Anywhere Lane

Billing Detail:

Water Charges: (a)			
Tier 1 – (0-100)	$4.70/ccf	100	$470.00
Tier 2 – (101-250)	$5.10/ccf	150	$765.00
Tier 3 – (251-500)	$5.73/ccf	250	$1,432.50
Tier 4 – (500+)	$6.13/ccf	50	$306.50
Total Water Charges		550	**$2,974.00**
Wastewater (Sewer) Charges: (b)			
Sewer Consumption	$6.23/ccf	550	$3,426.50
Total Wastewater Charges		550	**$3,426.50**
Other Charges: (c)			
Fire Service			$27.33
Stormwater Charge	$104.89/acre	2.1	$220.27
Base/Service Charge			204.33
Total Other Charges			**451.93**
Total Charges			**$6,852.43**

Summary of Charges:

Previous Balance	$6,221.38
Payment – Thank you	$6,221.38
Water, Wastewater, Other Charges	$6,852.43
Adjustments/Deposits	$0.00
Total Charges	**$6,852.43**

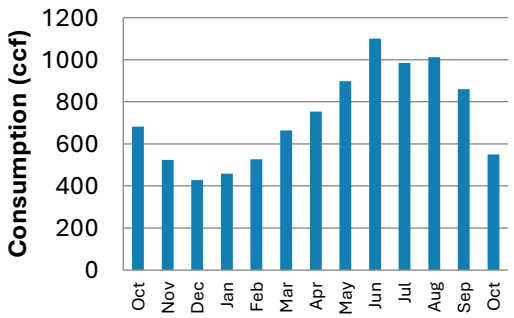
Meter ID: 12345

Meter Size: 2”	
Current Meter Reading	33,127
Prior Meter Reading	32,681
Water Usage This Period (ccf) (d)	446
Water Usage This Period Last Year	682

Meter ID: 67890

Meter Size: 2”	
Current Meter Reading	982
Prior Meter Reading	878
Water Usage This Period (ccf)	104
Water Usage This Period Last Year	159

Consumption (e)



(a) Example shows an increasing block rate structure in which the utility charges a higher rate for increasing increments of water consumed. Some utilities charge a flat rate regardless of consumption volume, while other utilities charge a decreasing block rate structure. Water charges take into account total water consumption from all water meters.

(b) Sewer charge is per amount of water discharged to sewer, which is often billed at a single rate, but could also have varying rates depending upon the quantity discharged. Oftentimes, this is based on the metered amount of water use (not a separate wastewater meter), which assumes that all water used was discharged to the sewer. In some cases, a facility can receive a sewer charge deduction for water uses that are known to not be sent to the sewer, such as cooling tower evaporation and irrigation water use. This deduction might appear on the bill.

(c) The utility could charge other fees, including fire service, stormwater, or other base or service charges. Stormwater fees can be based on the facility acreage or area of impervious surfaces. The base or service charge could depend upon the size of the water meter.
(d) Water usage is for the billing period for a specific water meter. In this example, water usage is reported in units of hundred cubic feet (ccf). Other common units include gallons, thousands of gallons (kgal), acre-feet, and liters. Note: A ccf is equivalent to approximately 748 gallons (2,832 liters) and an acre-foot is equivalent to 325,851 gallons (1,233,480 liters).
(e) In some cases, the utility might provide historical water use information, which can help identify any large leaks or anomalies. It might also show seasonal trends in water use.

Establish a Water Use Baseline

Establishing a water use baseline provides a reference point from which progress can be measured toward achieving water management goals. It is also an important component of developing a facility water balance, as discussed below. To develop a water use baseline, consider the following:

- Using the water bills gathered from one or two years prior, document the facility's water use history using a form such as the Water Consumption History Worksheet provided on WaterSense's Tools for CI Facilities web page at www.epa.gov/watersense/tools-ci-facilities. In addition, consider documenting and tracking water use history using ENERGY STAR Portfolio Manager at www.energystar.gov/buildings/benchmark.
- Calculate the facility's total annual water use for each metered and unmetered water source and total for all water sources combined. This total annual water figure will serve as the facility's water use baseline.
- If long-term historical water use data are available, look for any anomalies that might suggest that the established water use baseline is not representative of typical facility water use (e.g., a large leak or a system or process change that occurred and temporarily skewed water use). If an anomaly is present, either adjust the baseline as appropriate or identify a different year that can serve as the baseline.

Emergency Water Supplies

Establishing a water use baseline can also serve as the first step toward determining how much water would be needed in an emergency or a water supply disruption. To start this portion of the plan, describe how the facility will meet minimum water needs in an emergency or minimum water use requirements in a drought or water shortage. Next, identify high-priority water uses and essential equipment that must be maintained during a disruption. Often, additional water supplies must be procured to provide enough water for health and safety needs within the building (e.g., toilet flushing and hand washing) or to maintain equipment such as cooling towers.

Finally, determine how to recover the system after the water supply has been restored (e.g., cleaning equipment or flushing the system). For more information, review the *Emergency Water Supply Planning Guide for Hospitals and Healthcare Facilities* at www.cdc.gov/healthywater/emergency/ewsp.html.

Inventory Major Water-Using Fixtures, Equipment, Systems, and Processes

Once the baseline is established, it is critical to understand how specific fixtures, equipment, systems, and processes contribute to the overall facility water use. This process can help the water management team establish a baseline for individual end uses of water and identify potential reduction opportunities. It can also facilitate the establishment of water management planning goals. Three important components of a water assessment include: reviewing existing data, touring the facility to inventory water-using equipment, and verifying water use when possible.

Review Existing Data

As a first step in the inventory process, plot one or two years of water use data from bills, logbooks, or other available sources to identify seasonal trends or abnormalities. Note any peaks, particularly in the summer months, which can indicate how much additional water is used for building cooling and irrigation systems. Use this analysis to estimate cooling and irrigation water use if those sources are not submetered.

Tour the Facility to Inventory Water-Using Equipment and Meter Locations

Touring the facility to identify and inventory all of the major water-using fixtures, equipment, systems, and processes is a key step in identifying how a facility can improve its water management. During the tour, make note of any obvious areas for improvement (e.g., leaking fixtures, single-pass cooling, outdated equipment). In addition, consider the following:

Facility tour of water-using equipment

- Interview any personnel that manage water-using systems or equipment to understand how the systems and equipment are operated and maintained and verify water use.
- Capture enough detailed information about all water-using fixtures, equipment, systems, and processes to determine how much water is consumed by each end use. At the same time, consider the water quality needs of different end uses. This may also help with determining whether alternative sources of water could provide the quality of water needed to serve the intended end use. For example, some end uses such as toilet flushing, cooling towers, irrigation systems, and fountains may not require water treated to potable standards.

- Use survey forms or checklists, such as the Existing Plumbing Equipment and Water Use Inventory Worksheets provided on WaterSense's Tools for CI Facilities web page at www.epa.gov/watersense/tools-ci-facilities. These worksheets can be used to record fixture or equipment inventories, water use characteristics (e.g., fixture flow rates), and water use patterns. Collecting make and model numbers can make it easy to look up product information that can later be used to estimate water use. Working with equipment operators where necessary, record the hours of operation for each system or fixture to more accurately calculate water use over time.
- During the tour, pay particular attention to drain lines plumbed to floor drains in building mechanical and utility spaces. Trace these drain lines back to the originating equipment to make sure they are included in the inventory.
- Identify locations of all meters and submeters if the locations were not determined during the data-gathering phase. Read the meters and submeters, and check that the units and scale of the readings match water bills and internal logbooks.
- Throughout the tour, identify the highest priority water uses and essential equipment that must be maintained during a water supply disruption. Additional water supplies may be required to meet the highest priority water uses and to run this equipment for the duration of the disruption.

Condensate from an air handler flowing to a floor drain, which is a non-potable water source that could be used for cooling tower make-up water or other non-potable uses

- When outdoors, evaluate the landscape and look for signs of overwatering or underwatering. Run the irrigation system and identify areas where sprinklers may be misdirected or spraying on impervious surfaces. Consider whether existing landscaped areas can be converted to more regionally appropriate or drought-tolerant plant species and cut off from irrigation.
- Also while outdoors, evaluate stormwater flow onsite. Identify areas where water is flowing or standing. Mark on a site map which direction stormwater runoff flows across the site, collects in low spots, and leaves the site. Locate impervious surfaces and where they drain. Use a site assessment worksheet for your inventory, such as the one found in the Appendix of *Saving the Rain: Green Stormwater Solutions for Congregations* at www.epa.gov/nps/saving-rain-green-stormwater-solutions-congregations.

Verify Water Use When Possible

It may be possible to measure or verify the water use from some fixtures, equipment, systems, or processes. When verifying water use, consider the following:

- If discharge from water-using equipment or processes is evident or can be initiated during the tour, use a bag or bucket to manually collect water use over a 15-, 30-, or 60-second time period. Measure the water use collected during that time period to determine flow rates.
- If possible, install temporary water meters or flow meters for larger water-using equipment or processes and briefly monitor water use. If the water use is fairly consistent throughout the day, water use could be measured for a period of a few minutes to estimate typical water use. If the water use fluctuates throughout the day, water use data should be collected over a 24-hour period to estimate an average water use. It is important to note the days of operation for each water use measured in order to estimate annual water use.

For more detailed instructions on conducting a water efficiency assessment, refer to the following resources, which are linked in the footnotes:

- U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) Water Evaluation Tools[6]
- South Florida Water Management District's *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities*[7]
- City Energy Project's *Water Audit Guidance for Commercial Buildings*[8]

Create a Facility Water Balance

The facility water balance is an accounting of all water uses at the facility. It indicates the relative contribution of specific end uses to the facility's overall water use (i.e., baseline) and is a powerful tool for identifying, evaluating, and prioritizing water efficiency improvements. It also provides a mechanism to identify water that is unaccounted, which might be attributed to leaks. See Table 1 and Table 2 on page 14 for an example of a laboratory facility water balance. It is important to develop a water balance for all types of

[6] U.S. Department of Energy (DOE), Federal Energy Management Program (FEMP). November 2020. Water Evaluation Tools. www.energy.gov/femp/articles/water-evaluation-tools.
[7] South Florida Water Management District Water Supply Development Section. July 2013. *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities.* www.sfwmd.gov/document/water-efficiency-and-self-conducted-water-audits-commercial-and-institutional-facilities.
[8] City Energy Project. May 2019. *Water Audit Guidance for Commercial Buildings.* www.cityenergyproject.org/resources/water-audit-guidance-for-commercial-buildings/.

source water that a facility might be using. The following steps will help with creating a water balance:

- Sum the measured or estimated water use from all of the individual end uses for each water source. The sum of all end uses should roughly equal the facility's total baseline water use.
- For metered or submetered fixtures, equipment, systems, and processes identified, calculate typical annual water use from meter readings, water bills, or internal logbooks.

Calculating a water balance and graphing data

- For unmetered fixtures, equipment, systems, and processes identified, estimate the annual water use from flow rate measurements collected during the facility tour (if available) or use equipment specifications and patterns of use. Consult the relevant best management practices within *WaterSense at Work* at www.epa.gov/watersense/best-management-practices to help develop water use estimates for specific fixtures or equipment. Most sections of *WaterSense at Work* provide equations to help calculate water use of existing equipment and potential retrofits or replacements.
- In some cases, the use of onsite alternative water sources (see *WaterSense at Work Section 8: Onsite Alternative Water Sources*) can offset the use of potable water. Track these sources separately in the facility water balance to fully account for all sources of supplied water.
- If more than 10 percent of water use cannot be accounted for in the water balance, there could be an unidentified water end use, a leak, or another issue warranting further investigation. Refer to *WaterSense at Work Section 2.2: Leak Detection and Repair* to help identify and fix leaks.

Table 1. Example Lab Facility Water Balance for Potable Water Source

Major Process	Annual Water Use (gallons)	Percent of Total	Basis of Estimate
Total Annual Potable Water Supply	**4,900,000**	**100%**	**Monthly Water Bills**
Use 1: Sanitary (e.g., Toilets, Urinals, Showerheads, Faucets)	550,000	11%	Engineering estimate of 750,000 gallons per year, subtracting onsite rainwater supply metered to be 200,000 gallons per year
Use 2: Water-Cooled Ice Machine in Commercial Kitchen	300,000	6%	Engineering estimate using manufacturer product literature
Use 3: Pre-Rinse Spray Valve	50,000	1%	Engineering estimate based on measured flow rate
Use 4: Steam Sterilizer (i.e., Continuous Discharge Tempering Water)	300,000	6%	Instantaneous flow rate measurement
Use 5: Reverse Osmosis Supply	100,000	2%	Metered
Use 6: Cooling Tower Make-Up Water	3,000,000	61%	Metered
Use 7: Steam Boiler Make-Up Water	300,000	6%	Metered
Sum of Accounted for Potable Water Use	4,600,000	94%	Summed from uses 1 through 7
Unaccounted Potable Water Use	300,000	6%	Calculated by difference from total water use and accounted for water use (since this is less than 10 percent, the facility likely does not have a significant leak)

Table 2. Example Lab Facility Water Balance for Air Handler Condensate Supply

Major Process	Annual Water Use (gallons)	Percent of Total	Basis of Estimate
Total Annual Air Handler Condensate Supply	**500,000**	**100%**	**Metered**
Use 1: Cooling Tower Make-Up Water	500,000	100%	Metered (separately from city-supplied make-up water)
Sum of Accounted for Air Handler Condensate Water Use	500,000	100%	Use 1
Unaccounted Air Handler Condensate Water Use	0	0%	Calculated by difference from total water use and water use accounted for

Address Water Quality

For all types of facilities, but especially those that serve potentially immunocompromised populations, such as hospitals or long-term health care facilities, it is important to take water quality and safety into consideration when carrying out water management plans and actions that are focused solely on water use. A more comprehensive water management plan can include additional components to address water quality and safety, including: identifying locations where *Legionella* and other opportunistic plumbing pathogens might grow and spread to people; identifying control measures to minimize risk; and monitoring water quality. Consider adding these activities to your planning process.

Identify Places Where Water Quality May Become Impaired

Once you have identified where water is being used, it is vital to determine where conditions exist that would allow pathogens to grow and spread. Generally, pathogens such as *Legionella* can grow where water stagnates, where disinfection levels are low, and where there could be interruptions in the water supply. *Legionella* can spread to people in places where water is aerosolized or sprayed such as hot tubs, sinks/showers, pools, cooling towers, and decorative fountains. Other water quality issues such as lead contamination can be an issue at the point of consumption (e.g., a faucet or water fountain). Review your facility diagram and mark the areas where potential hazards exist, including:[9]

- Locations where water quality may become impaired.
- Locations where water can stagnate, such as "dead ends," "dead legs," or areas of the facility that have little or no occupancy.
- Sections where temperature may not be well controlled or where heat may be transferred.
- Areas where disinfection levels may be lower.

Special Considerations for Water Quality in Healthcare Facilities

In healthcare facilities, it is important to evaluate water quality risks in locations not typically found in most commercial facilities:

- Identify areas of extra vulnerability.
- Identify where immuno-compromised patients may be located (e.g., ICU, NICU, oncology, dialysis, burn unit, operating rooms, bone marrow transplant units).
- Identify areas where patients are more likely to be exposed to water droplets (e.g., hydrotherapy, respiratory therapy, shower facilities).
- Identify in-hospital water features, such as fountains or reflection pools.

[9] U.S. Department of Health and Human Services. Centers for Disease Control and Prevention (CDC). June 2021. *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings: A Practical Guide to Implementing Industry Standards*. Version 1.1. www.cdc.gov/legionella/wmp/toolkit/index.html.

- Seldom-used equipment such as emergency showers, eye-wash stations, and fixtures in patient rooms.
- Equipment needing extra attention such as ice machines, cooling towers, decorative fountains, and hot tubs.
- Areas under major construction or where a water service change occurs:
    - New construction
    - Equipment changes
    - Changes in treatment products (e.g., disinfectants)
    - Changes in water usage (e.g., high and low season for a hotel)
    - Changes in the municipal water supply.

Establish Water Quality Control Measures and Monitor Water Quality

Once areas that present a risk have been identified, it is important to establish water quality control measures. Control measures are used specifically to manage risk and water safety to protect occupants from water quality impairments and pathogens in the system. There are many types of control measures, but most involve piping system design, temperature control, filtration, disinfection, and/or cleaning and maintenance.

In addition to verifying water use, it is important to actively manage water quality using routine sampling and monitoring to verify that the control measures are working as expected to minimize risk in the system. To learn more about potential water quality problems and *Legionella* in commercial and institutional facilities and how to create sampling, monitoring, and control measures, see the Center for Disease Control and Prevention (CDC) toolkits: *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings* (www.cdc.gov/legionella/wmp/toolkit/index.html) and *Controlling Legionella in Common Sources of Exposure* (www.cdc.gov/legionella/wmp/control-toolkit/index.html).

Step 3. Set and Communicate Goals

Once the water management team understands how the facility is currently using water, the next step in the water management planning process is to gather building owners, facility management staff, senior management, and any other key decision-makers to develop a list of water management goals and policy initiatives. Employees from all different parts of the organization should be included in the goal-setting process to obtain a range of perspectives and promote a sense of ownership. The goals will drive the water management program and help fuel continuous improvement.

Once water management goals and policies have been developed, they must be communicated to the entire organization with the support of senior management or the building owners. Top-level support gives legitimacy to the initiative and informs employees

that water and energy reductions are a priority. A feedback mechanism should be created to encourage input, suggestions, and reporting of problems.

Examples of water management goals may include:

- Reduce water use by a certain percentage per year for a period of years for a total target percent reduction in the future, based upon the facility's established water use baseline.
- Complete projects identified through the water management planning process within a set timeframe.
- Upgrade and focus on making whole areas water-efficient, such as mechanical systems, restrooms, or commercial kitchens.
- Establish a leak detection program to identify and correct any unaccounted water use that could be attributed to leaks.
- Incorporate information and considerations related to water safety and risk management into water management activities to protect employees and other occupants.
- Create an emergency preparedness plan for the water supply so there are minimal disruptions to building services.
- Reduce site stormwater runoff using green infrastructure features.
- Use onsite alternative water sources to replace a certain percentage of potable water use.
- Achieve net-zero water status.
- Participate in a program to incentivize water use reductions (e.g., DOE's Better Buildings Challenge).[10]
- Obtain recognition for water reduction efforts from a federal, state, or local program (e.g., California Green Business Network and Wisconsin Green Tier Program).[11,12]
- Achieve facility-level certification, such as the U.S. Green Building Council's LEED® rating system or ENERGY STAR. State and local level certification programs can also provide benefits to commercial and institutional buildings. Sector-specific programs, such as the Virginia Green Program or the Green Restaurant Association

[10] DOE. Better Buildings Challenge. https://betterbuildingssolutioncenter.energy.gov/challenge.
[11] California Green Business Network. www.greenbusinessca.org/.
[12] Wisconsin Department of Natural Resources Green Tier Program. https://dnr.wisconsin.gov/topic/GreenTier.

program, are often tailored to promote significant reductions in environmental impacts in specific areas or industries.[13,14]

When setting and communicating goals, consider the following:

- Ensure that goals are measurable and achievable. Remember that goals can always be strengthened if the organization achieves success sooner than initially anticipated.
- Establish realistic implementation timeframes and dates.
- Consider facility-specific conditions such as local regulations and requirements, long-term drought, or water use restrictions when establishing goals.
- Communicate goals to employees, building occupants, and other relevant stakeholders to gain support for future projects.
- Conduct a kickoff event to engage employees facility-wide.
- Review *WaterSense at Work Section 1.3 User Education and Facility Outreach* at www.epa.gov/watersense/best-management-practices for information on communicating with staff on water goals.

Step 4. Create an Action Plan

Using the water balance as a guide and considering any major areas for improvement noted during the assessment process, the water management team can create a detailed action plan. This includes solidifying water management opportunities into specific projects or operational and maintenance changes and prioritizing that project list. The action plan should determine which projects and practices can be implemented at the facility to achieve established water management goals. Creating an action plan consists of the following steps:

- Identify actions or projects and calculating associated cost and potential savings.
- Identify financing sources.
- Calculate simple payback and net present value.
- Prioritize projects.
- Document project priorities in a detailed action plan.

Identify Actions or Projects and Calculate Associated Cost and Potential Savings

A checklist of potential projects and practices that you could include in an action plan is included on page 28. The checklist can be filled out after the water assessment to help

[13] Virginia Green. www.virginiagreen.net/.
[14] Green Restaurant Association. www.dinegreen.com/.

decision-makers determine where to focus their resources. As you develop an initial list of potential projects and actions, consider the following to improve water efficiency, quality, and resilience.

- For water efficiency:
    - Utilize information gathered during the water assessment to determine which operational and maintenance changes and retrofit and replacement projects might be viable at the facility. Consider the largest uses of water identified from the water assessment and included in the facility water balance. These might be areas to target for the most significant water savings.
    - Evaluate the benefits from installing additional meters or submeters to monitor water use (see *WaterSense at Work Section 2.1: Metering and Submetering* at www.epa.gov/watersense/best-management-practices).

Facility submeter

    - Consider the impact of codes and standards that mandate or incentivize the use of certain fixtures or equipment (see *WaterSense at Work Section 1.4: Codes, Standards, and Voluntary Programs for Water Efficiency* at www.epa.gov/watersense/best-management-practices).
    - Optimize your water use by determining whether there are opportunities to reuse water from other applications. Consider water sources near the intended end use or that would not require significant new plumbing. Make sure that the quality of water to be recycled or reused is fit for the purpose of the intended end use, or identify alternative sources (e.g., rainwater) that could serve the intended end use. Review *WaterSense at Work Section 8: Onsite Alternative Water Sources* at www.epa.gov/watersense/best-management-practices for more information.
- For water quality:
    - Use the information collected in the assessment to determine the specific preventative maintenance procedures and plans needed to address deficiencies and vulnerabilities in the system. Apply the water control measures and monitoring plan to check the system at points of vulnerability.

  - Work with staff and vendors to monitor performance. Conduct sampling for pathogens, water quality parameters, temperature, pH, and other water conditions. Combine monitoring activities related to water quality with those related to water efficiency (e.g., verify flow rates and ensure equipment and components are working as expected at the same time that sampling or flushing is being performed).
  - Consider creating a plan for flushing building water system and/or system components and fixtures during low occupancy to prevent stagnation.
  - To learn more about actions to address water quality problems and water control plans, review CDC's *Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings* and *Toolkit for Controlling Legionella in Common Sources of Exposure* at www.cdc.gov/legionella/wmp/index.html.

Balancing Water Quality and Efficiency

A facility may determine that a flushing program for the building water system(s) is necessary for water quality control and maintaining building health to protect occupants. While it is important to use water efficiently, system flushing to protect occupants can be the greater priority. Focus on saving water in other areas and, if possible, collect the water flushed through the system for other uses such as watering landscapes.

- For water supply disruptions:
  - Decide which alternative water sources to rely on during an outage and whether water restrictions will be necessary during the disruption.
  - Determine how the facility will recover after water service has been restored (e.g., flushing the system with fresh water, cleaning and disinfection of equipment).
  - Work with the local water utility and other regional and state associations to ensure that plans are compliant with all requirements.[15]
- For stormwater management:
  - Identify projects that incorporate stormwater management and green infrastructure into the landscape such as a rain garden, bioretention area, or water harvesting. Review resources developed by EPA's Green Infrastructure program (found at www.epa.gov/green-infrastructure) to learn more, as well as EPA's *Saving the Rain: Green Stormwater Solutions for Congregations* resource at www.epa.gov/nps/saving-rain-green-stormwater-solutions-congregations.

[15] CDC and American Water Works Association. *Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities*. Updated 2019. www.cdc.gov/healthywater/emergency/ewsp.html.

Once all opportunities have been evaluated, develop a final list of potential actions and projects to prioritize, and estimate individual project costs and potential savings as follows:

- For each identified project or practice, calculate the total estimated cost of the action and the total water, energy, and cost savings from usage reductions or changes to processes. Don't forget to incorporate savings from the avoided cost of detergents, chemicals, and equipment maintenance. Also consider less tangible benefits such as reductions in risk related to water quality or increased safety for emergency preparedness actions. Consult the relevant best management practices in Sections 2 through 8 of *WaterSense at Work* at www.epa.gov/watersense/best-management-practices for assistance with some of these calculations.
- South Florida Water Management District's *Water Efficiency Self-Conducted Water Audits at Commercial and Institutional Facilities* provides several equipment and process-specific water use and savings calculators, which can be useful for analyzing project-related water savings.[16]

Identify Financing Sources

Once a project is identified, determine if the project can be funded through the facility's operating expenses or capital funding mechanisms. The following financing sources and options can also be considered:

- For larger, more expensive pieces of equipment, consider leasing the equipment from a technology vendor. ENERGY STAR provides information on a variety of lease types for energy-using equipment, many of which might apply to water-using equipment, such as commercial laundry systems or water purification systems.[17]
- Look for rebates and incentive programs offered by the local water utility to assist commercial and institutional building owners in making water efficiency upgrades. Energy utilities also have rebates and incentives available to support projects that provide associated energy savings (e.g., laundry replacements, pre-rinse spray valve replacements).[18] Both WaterSense and ENERGY STAR maintain lists of some of their partners' rebate programs.[19,20] Rebate and incentive programs include free product distribution, partial rebates on purchases of water-

[16] South Florida Water Management District. Water Use and Savings Calculators. www.sfwmd.gov/documents-by-tag/waterefficiency.
[17] ENERGY STAR. 2007. *ENERGY STAR Building Upgrade Manual*. Chapter 4: Financing. www.energystar.gov/buildings/tools-and-resources/building-upgrade-manual.
[18] Database of State Incentives for Renewables & Efficiency (DSIRE). www.dsireusa.org/.
[19] EPA's WaterSense program. WaterSense Rebate Finder. www.epa.gov/watersense/rebate-finder.
[20] ENERGY STAR. ENERGY STAR Rebate Finder. www.energystar.gov/rebate-finder.

and energy-efficient products, financial incentives based on total gallons of water saved from implementing large-scale projects, and billing offsets based on submetered water use that can account for water that is not being sent to the sewer (e.g., metering cooling tower make-up water and blowdown water to account for evaporation). If rebates aren't being advertised, contact the utilities directly to see if custom rebates are available.

- Consider private financing, which can be obtained through performance contracts managed by water management service companies, energy service companies (ESCOs) or sometimes even energy utilities (UESCOs). The service company develops, finances, and installs projects designed to improve efficiency and maintenance costs for facilities over an agreed-upon time period. These service companies generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Water management service companies will develop and finance water efficiency projects, and some UESCO/ESCOs will also develop and fund standalone water efficiency projects, although it is more common for ESCOs to bundle energy and water efficiency upgrades. The utility cost savings from the projects pay for the projects themselves, and any additional cost savings on top of the capital costs are shared between the service company and the facility.[21,22]
- Look for state-specific financing programs. Many states have made water-efficiency projects eligible for Property Assessed Clean Energy (PACE) financing programs that are carried out by local governments.[23,24]

Calculate Simple Payback and/or Net Present Value

Simple payback, based on the project cost and anticipated annual water savings, can be an effective metric for prioritizing potential projects and practices for inclusion in the facility-specific action plan. In some cases, retrofitting or replacing equipment can also save energy, further reducing the simple payback period and increasing project cost-effectiveness. To calculate the simple payback for a specific project or practice, gather the following information and use Equation 1 on the next page:

- Determine the total project cost that will come from the facility's operating budget. If an alternative source of funding is available, such as a rebate to offset money spent from the facility's budget, subtract it from the total project cost, as it will make the project more cost-effective. The project cost should be the total that will come directly from the facility's budget only.

[21] ENERGY STAR, 2007*, op. cit.,* Page 6.
[22] National Association of Energy Service Companies. The ESCO Story. www.naesco.org/esco/.
[23] DOE, Office of State and Community Energy Programs (SCEP), Property Assessed Clean Energy (PACE) Programs. www.energy.gov/scep/slsc/property-assessed-clean-energy-programs.
[24] DSIRE. Programs. https://programs.dsireusa.org/system/program.

- Estimate the water savings from the project, as calculated using the equations found in Sections 2 through 8 of *WaterSense at Work* at www.epa.gov/watersense/best-management-practices.
- Identify the cost of water and wastewater. In some cases, the water utility deducts sewer charges for water that is not discharged to the sanitary sewer (e.g., water evaporated from the cooling tower or water applied to the landscape). In these cases, only consider the water cost when calculating simple payback of the project.

Equation 1. Simple Payback (years)

= Project Cost ÷ (Water Savings x Cost of Water and Wastewater)

Where:

- Project cost: Dollars
- Water savings: Gallons or liters per year
- Cost of water and wastewater: Dollars per gallon or liter

If the project has an associated energy impact, determine the energy source (e.g., gas or electricity) and utility cost. Calculate the energy impact and include it in the simple payback calculation. Applicable sections of *WaterSense at Work* provide equations to estimate energy and associated cost savings.

Net present value (NPV) can also be a useful metric to help demonstrate the return a facility can expect from a project, which can be used to prioritize investments. It is the measure of the present value of cash flows at a designated rate of return compared to the initial investment. Two projects could have the same payback period, but one may have a higher NPV and would, therefore, be a more desirable investment. An investment with a negative NPV will lose money for the company while an investment with a positive NPV will provide positive cash flow. A project with an NPV of 0 is neutral. To learn more about NPV in water efficiency projects, review the City Energy Project's *Water Audit Guidance for Commercial Buildings* at www.cityenergyproject.org/resource-library/policy-and-programs/performing-water-audits/.

Prioritize Projects

All projects and practices selected should be considered in the context of achieving established water management goals, as well as overall cost effectiveness. Once water management opportunities have been identified, they should be prioritized using criteria, such as urgency, cost effectiveness, amount of potential water savings, visibility, and environmental impact. The water management team should address the simplest and most urgent tasks first, as follows:

- Fix any equipment that is malfunctioning or leaking to target the most urgent issues first.
- Start with simple projects and practices, particularly for new water management programs. This will help create initial positive results and gain acceptance of program goals and initiatives.
- Review *WaterSense at Work*'s best management practices related to operation and maintenance that can be implemented quickly and easily (see www.epa.gov/watersense/best-management-practices). Often, simply changing the operations and maintenance procedures for equipment or systems can result in savings. These changes often are low- to no-cost options that can be more cost-effective than retrofits or replacements.
- Identify opportunities to incorporate water management projects into other capital projects, such as a building renovation or end-of-life equipment replacement.

A leaking hose spigot

Remaining projects should be prioritized based on facility goals. Depending on what the facility values most, projects can be prioritized in a variety of ways, including:

- Shortest to longest simple payback period.
- Highest to lowest NPV.
- Highest to lowest potential of water savings.
- Most visibility to least visibility (e.g., implementing a landscaping project before increasing cooling tower cycles of concentration).
- Greatest to least environmental impact (e.g., implementing projects with the greatest associated energy savings before those with only water savings).

Document Actions and Project Priorities in a Detailed Plan

Help ensure that projects are implemented and water management goals are reached by documenting the identified opportunities, specific projects, or operational and maintenance changes in order of priority. Remember that projects can be re-prioritized as they are completed or based on changing goals.

Step 5. Implement the Action Plan

The water management team should develop a targeted implementation strategy for the action plan, which can significantly increase project success and help achieve water

management goals. This might include gathering support for specific projects and practices. To maximize the opportunities for success, consider the following:

- Ensure that the necessary resources (i.e., time, money, personnel) are available to complete projects and practices included in the action plan.
- Complete identified projects and practices in order of priority.
- Promote key components of the action plan to employees and other relevant stakeholders to gain support for specific projects.
- Create incentives to encourage staff or those responsible for specific projects and practices to take action and do their part to help achieve water management goals.
- Be creative and consider other resources that may be available to assist in implementation, such as other employees, utility and government programs, interns, or engineering students.
- In the event of a drought or other water emergency, implement measures as specified in the emergency contingency plan.

When implementing the action plan, consider combining water efficiency, water safety, emergency preparedness, and stormwater management actions into standard operating procedures (SOPs), checklists, and other resources to help maintenance staff integrate practices into regular responsibilities. For example:

- Periodically verify flow rates of restroom fixtures while removing scaling and biofilm buildup or checking disinfection levels.
- Regularly monitor and log submeter data on major water-using systems.
- Review water treatment and inspection reports related to cooling towers, pools, irrigation systems, and other systems that may be maintained by a vendor.

Logging submeter data

Document activities, as appropriate, to maintain records of project completion, preventative maintenance, or ongoing monitoring that has occurred.

Step 6. Evaluate Progress

The water management team should periodically conduct a formal review of water use and quality data and action plan implementation in the context of achieving the established water management goals. This review allows the organization to evaluate progress, set new goals, and continually improve. The water management team can also

use the review to demonstrate and promote the success of the water management program, which can provide long-term support for the program and future projects and initiatives. Evaluations can include the following:

- Review water bills and meter and submeter readings to verify that the expected water savings are achieved. Ensuring that expected savings are seen is referred to as measurement and verification, and it is an important exercise to ensure that projects are operating as expected. DOE's FEMP has issued guidance on how to conduct measurement and verification for water projects.[25]
- Review the action plan, at least on an annual basis, and revise water management goals as they are achieved.
- Use ENERGY STAR Portfolio Manager[26] to track progress and compare water use over time. Portfolio Manager is an effective way to keep track of water use data and note water reduction successes.
- Conduct a detailed reassessment of the facility approximately every four years to develop an updated water balance and identify new water management goals and savings opportunities.
- Evaluate effectiveness of water quality control measures by verifying that control steps and monitoring are being done as planned.
- Review and update emergency preparedness plans to maintain readiness over time.

A water use assessment in progress

- Verify that changes made to address stormwater are still effective by evaluating the property after large rain events.

Step 7. Recognize Achievements

To gain and sustain support for a facility's water management program, the water management team can consider providing recognition for water management activities and achievements. This includes recognizing the contributions of those who have helped achieve the water management goals, as well as promoting the success of the program

[25] DOE, FEMP. November 2015. *Measurement and Verification for Performance-Based Contracts Version 4.0*. www.energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf.
[26] ENERGY STAR, Portfolio Manager Overview, *op. cit.*

internally and to external stakeholders. Following are a few ways to recognize water management efforts:

- Establish an internal recognition program to award personnel or teams that provided significant contributions toward achieving the water management goals. This might include an award for the generation of the best water efficiency ideas or the achievement of the greatest water use reductions (if measurable on an individual basis).
- Respond to employee and staff suggestions and reports of issues to encourage all parts of the organization to participate in the efforts.
- Explore opportunities for external recognition, such as competing in DOE's Better Buildings Challenge,[27] which recognizes top water savers.
- Report progress publicly to interested stakeholders to gain support for initiatives and recognition for water efficiency achievements.
- Report progress to facility staff and building occupants by using a newsletter or other outreach means as discussed in *WaterSense at Work Section 1.3: User Education and Facility Outreach* at www.epa.gov/watersense/best-management-practices.

Action Plan Opportunity Checklist

A checklist of potential projects and practices that you could include in an action plan is included on the next page.

[27] DOE. Better Buildings Challenge. https://betterbuildingssolutioncenter.energy.gov/challenge.

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Getting Started With Water Management				
Create an emergency preparedness plan for water supply interruptions.	1.2			
Educate facility staff, building occupants, employees, and visitors on water management program goals and initiatives.	1.3			
Review, understand, and utilize information in codes, standards, and voluntary programs for water efficiency.	1.4			
Incorporate information related to water safety and risk management into the comprehensive water management plan.	1.6			
Water Use Monitoring				
Read water meters and record monthly water use.	2.1			
Install submeters on any major water-using equipment, systems, or processes.	2.1			
Implement a leak detection and repair program.	2.2			
Communicate to building occupants and visitors how to report water leaks.	2.2			
Benchmark water use against similar buildings.	2.3			
Sanitary Fixtures and Equipment				
Replace old tank-type toilets with WaterSense labeled models.	3.1			
Check tank-type toilets for leaks, worn flappers, and other parts that require periodic replacement.	3.1			

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Replace old flushometer-valve-type toilets with WaterSense labeled models or install retrofit dual-flush conversion devices.	3.1			
Inspect diaphragm or piston valves in flushometer-valve toilets and urinals annually and replace any worn parts. Verify flush volume using a timed flush test.	3.1, 3.2			
Replace old flushing urinals with WaterSense labeled models.	3.2			
Check flow rates of faucets and showerheads while removing scale and biofilm buildup.	3.3, 3.4			
Replace lavatory faucets or faucet aerators (for private use) with WaterSense labeled models and install 0.5 gallon per minute (gpm) lavatory faucets or aerators in public use settings.	3.3			
Replace old showerheads with WaterSense labeled models.	3.4			
Wash only full loads of laundry.	3.5			
Replace old clothes washers with ENERGY STAR certified models or consider the water factor when purchasing large or industrial-sized laundry machines.	3.5			
Install a water recycling or ozone system on large commercial laundry equipment.	3.5			
Commercial Kitchen Equipment				
Replace existing pre-rinse spray valves with DOE-compliant models that uses 1.28 gpm or less.	4.1			

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Replace old ice machines with air-cooled, ENERGY STAR certified models.	4.2			
Shut down or use standby mode for all continuously flowing equipment between uses. Check all shutoff valves and self-closing nozzles regularly to ensure flow is stopped when equipment is in standby mode or shut down.	4.2 - 4.10			
Replace gaskets and tighten hinges on steam equipment doors to provide a good seal to retain heat or steam.	4.3, 4.4			
Replace old combination ovens and steam cookers with ENERGY STAR certified models.	4.3, 4.4			
Load steam cookers, steam kettles, and combination ovens to capacity.	4.3, 4.4, 4.5			
Switch to connectionless steam cookers and steam kettles.	4.4, 4.5			
Replace old, water-cooled wok stoves with waterless models.	4.6			
Install in-line flow restrictors to reduce dipper well flow rates to 0.3 gpm.	4.7			
Use a broom or mop instead of a water broom or high-pressure hose to clean floors.	4.8			
Hand scrape food from dishes or install food strainers and compost food waste instead of using a food disposal. Turn off food disposals during idle periods.	4.9			
Load dishwashers to capacity.	4.10			
Replace old dishwashers with ENERGY STAR certified models.	4.10			

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Thaw frozen food in a refrigerator rather than under running water.	4.11			
If there isn't time to defrost frozen food in a refrigerator, use a device that is able to recirculate cold water for defrosting.	4.11			
Outdoor Water Use				
Plant native or drought-tolerant species.	5.1			
Use mulch around trees and plant beds.	5.1			
Install WaterSense labeled irrigation controllers and/or consider installing rain sensors.	5.2			
Check the pressure in the irrigation system and consider installing WaterSense spray sprinkler bodies or a pressure reduction valve if the pressure is at or above 60 psi.	5.2			
Use drip irrigation to water plant beds.	5.2			
Ensure irrigation schedules are appropriate for climate, soil conditions, plant materials, grading, and seasons.	5.2			
Have an irrigation professional certified by a WaterSense labeled program conduct an irrigation audit.	5.2			
Check the position and location of spray heads to ensure that they are working properly and water is not being directed onto non-landscaped areas such as sidewalks.	5.2			
Use pool covers to control evaporation loss.	5.3			

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Maintain proper pool chemistry to limit pool cleaning and drainage events.	5.3			
Use friction washing in vehicle washes and consider installing a water reclamation and reuse system.	5.4			
Mechanical Systems				
Eliminate single-pass cooling.	6.2			
Professionally monitor cooling tower and boiler chemistry and maximize cycles of concentration while checking temperature, pathogen, and disinfection levels.	6.2, 6.5			
Install cooling tower submeters and control systems to control chemical feed blowdown and make-up based on conductivity. Monitor submeters to detect malfunctions and problems as soon as possible.	6.3			
Regularly maintain and clean chillers, air handler coils, heat exchangers, condensers, and evaporator coils to prevent scale, biological growth, and sediment buildup.	6.3, 6.4			
Regularly check and maintain boilers, steam lines, and steam traps.	6.5			
Laboratory and Medical Equipment				
Use water purification only when necessary.	7.1			
Select reverse osmosis or other membrane treatment systems with a high recovery rate.	7.1			
Turn off vacuum pumps when not in use.	7.2			

Action Plan Opportunity Checklist

Water Use Reduction Opportunity/Project	Reference Section	Already Implemented ✓	Evaluate/ Consider ✓	Not Applicable ✓
Install thermostatically-actuated valves to control the flow of cooling water for steam sterilizer condensate discharge.	7.3			
Replace old steam sterilizers and vacuum pumps with newer models that do not use single-pass cooling or condensate discharge tempering water.	7.2, 7.3			
Turn water off when fume hood filtration isn't in use and encourage users to close the sash when not conducting experiments.	7.5			
Considering treatment needed for facility-specific experiments, replace old fume hoods with a filtration system that does not require water if possible (e.g., activated carbon).	7.5			
Inspect and repair worn cage-and-rack washer valves and rinse nozzles.	7.6			
Run steam sterilizers, glassware washers, and cage-and-rack washers only when full.	7.3, 7.4, 7.6			
Convert from traditional film to digital X-ray equipment.	7.7			
Onsite Alternative Water Use				
Consider using onsite alternative water for irrigation, fountains, cooling tower make-up, toilet and urinal flushing, fume hood scrubbers, and other uses not requiring potable water.	8.0			

Additional Resources

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