WaterSense® Multifamily Housing Water Assessment Worksheets

The U.S. Environmental Protection Agency (EPA) Water Score is generated by [ENERGY STAR® Portfolio Manager®](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager) and supported by the EPA WaterSense program. The EPA Water Score is a joint effort between the two programs that allows multifamily housing properties to receive a 1 to 100 score based on whole building or property water use relative to average national performance. The EPA Water Score is obtained by entering property information and water use data into ENERGY STAR Portfolio Manager.[[1]](#footnote-1)

WaterSense developed these Multifamily Housing Water Assessment Worksheets to assist property owners, managers, and staff in assessing existing equipment and management strategies and to target potential areas of improvement. After completing these steps, a user should be able to:

* Assess water consumption and associated costs at multifamily housing properties.
* Use data to help identify cost-effective opportunities to reduce water consumption and improve the operating performance of water-consuming systems.
* Provide a mechanism to report water assessment findings to property management, ownership, or other decision makers and prioritize water efficiency projects.

In addition to improving a property’s EPA Water Score, identifying and implementing water efficiency improvements at a multifamily property can result in many other benefits, including:

* Reduced operating costs from reducing overall water consumption at the property, as well as reduced energy consumption associated with water heating and pumping.
* Reduced operating and maintenance (O&M) costs, since newer, more efficient appliances and equipment typically requires less servicing and maintenance.
* Reduced impact of fluctuations in water costs that may negatively impact a property’s cashflow.
* Conservation and reuse of water, particularly important in areas with limited supply.
* Improved compliance with current or future regulatory requirements affecting water consumption.

For more information and technical resources related to water efficiency in multifamily housing, please visit the [WaterSense website](https://www.epa.gov/watersense/water-score-multifamily-housing).

## Getting Started

This tool is designed for a person of any experience level to conduct a water assessment (e.g., tour or walk-through) of a multifamily housing property and identify key water use areas. These worksheets are a companion resource to the EPA Water Score and WaterSense [Water Efficiency Management Guides](https://www.epa.gov/watersense/water-score-multifamily-housing). Together these tools are intended to provide water-savings project ideas for further consideration. Before initiating a potential project, WaterSense recommends thoroughly evaluating the project’s cost and savings to accurately evaluate its cost-effectiveness.

The worksheets are organized according to applicable WaterSense Water Efficiency Management Guides and include:

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| Worksheet 1: Property Information   * General property and water use information * Water and energy rates   Worksheet 2: Metering and Billing   * Water meter information * Water usage information   Worksheet 3: Bathroom Suite   * Toilets * Bathroom sink (lavatory) faucets * Showerheads * Bath and shower diverters   Worksheet 4: Kitchen and Laundry   * Kitchen faucets * Dishwashers * Clothes washers | Worksheet 5: Landscaping and Irrigation   * Irrigation equipment * Water features * O&M checklist   Worksheet 6: Pools   * Pools * O&M checklist   Worksheet 7: Heating, Ventilation, and Air Conditioning (HVAC) and Mechanical   * Cooling towers * Single-pass cooling * O&M checklist   Appendix A: Summary of Needed Repairs and Replacement Items |

Following are tips to help in getting started:

* Prior to conducting the walk-through, identify and print the relevant worksheets for the water uses at your property. Note: If you have not already entered your multifamily housing property information and water meter information into [ENERGY STAR Portfolio Manager](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager) to obtain an EPA Water Score, complete Worksheet 1. Worksheet 1 will help facilitate reporting to Portfolio Manager and help you capture the property information required for the EPA Water Score. Alternatively, you can use Worksheet 1 to input property information that is helpful for your own tracking purposes.
* Familiarize yourself with the relevant worksheets and make a plan of attack for each water use area. Each worksheet provides guidance to help you identify the major water uses and relevant information for various fixtures, appliances, and equipment. The worksheets also indicate the data inputs for calculations in the WaterSense [Water Efficiency Management Guides](https://www.epa.gov/watersense/water-score-multifamily-housing) so that you can estimate water, energy, and cost savings. Shaded cells indicate data inputs required in calculations; be sure to complete these cells so that you can calculate an accurate savings estimate.
* Identify the appropriate property/building staff and vendors familiar with specific areas of the property to help obtain the information needed for each worksheet. Helpful personnel and vendors might include:
* Facility manager
* Facility engineer
* Maintenance manager
* Facility operations staff
* Plumber
* Landscaping/outdoor maintenance manager and staff
* Landscape/irrigation professional
* Laundry equipment vendor or route operator
* Cooling tower maintenance/water treatment vendor
* Pool maintenance/chemical vendor
* Contact your local water and energy utilities, which may be able to help with water assessments and provide rebates for water- and energy-efficient upgrades identified.
* Use the Additional Notes section at the end of each worksheet to identify malfunctioning equipment, leaks, or operational improvements that should be addressed immediately following your assessment, as well as any other information you would like to remember that is not captured elsewhere on the worksheet. Walk-through notes from these sections can be compiled in Appendix A: Summary of Needed Repairs and Replacement Items.

To learn more about developing a water management plan for your property, including how to establish a water efficiency team, conduct a water assessment, set goals, prioritize projects, and evaluate progress, review Section 1.2: Water Management Planning of [*WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities*](http://www.epa.gov/watersense/docs/ws-at-work_bmpcommercialandinstitutional_508.pdf).

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# Worksheet 1: Property Information

If you haven’t already entered your property’s information into [ENERGY STAR® Portfolio Manager](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager)®, the following worksheet can be helpful in organizing your information. Even if you’ve already received your EPA Water Score, having this property-specific information at your fingertips will be helpful for the rest of the assessment.

## Getting Started

To begin this worksheet, fill out the table below with general information about your multifamily housing property.

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| --- | --- |
| **Property Details** | |
| **ENERGY STAR Portfolio Manager Data Inquiry** | **Property-Specific Data** |
| Building Size (square feet) |  |
| Construction Year (or year of significant renovation) |  |
| Building Gross Floor Area (square feet) |  |
| Irrigated Area[[2]](#footnote-2) (square feet) |  |
| Occupancy (% of units occupied) |  |
| Total Number of Residential Living Units |  |
| Number of Bedrooms |  |

## Estimating Occupancy

Knowing whole property or individual unit occupancy is important when determining estimated water and energy savings from certain water efficiency projects or upgrades. For example, replacing two showerheads with more efficient WaterSense labeled models in an apartment with four occupants will achieve more water and energy savings than replacing the same showerheads in an apartment with one occupant.

Providing occupancy data specific to your property or units within your property will yield more accurate savings estimates and project payback periods. However, it is understandable that this information may not be able to be collected for all properties. In cases where property- or unit-specific occupancy is not available, use the equations below to estimate occupancy. Equations are provided for estimating average occupancy in both multifamily and low-income multifamily properties. The table below can be used to summarize your property’s occupancy information.

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| --- |
| Equations for Estimating Multifamily Occupants per Unit Based on Number of Bedrooms[[3]](#footnote-3) |
|  |
| **Average Occupancy per Unit for Multifamily = 1.49 + (0.45 x Number of Bedrooms)**  **Average Occupancy per Unit for Low Income Multifamily = 1.69 + (0.57 x Number of Bedrooms)**  These equations can be used to estimate the occupancy of a specific unit, or to estimate the total occupancy of a building. Total building occupancy can be estimated by calculating an average number of bedrooms per unit.  For example, a multifamily building has 30 one-bedroom units and 15 two-bedroom units.  **Average bedrooms per unit *=***  **= 1.33 bedrooms/unit on average**  **Average occupancy per unit =**  **2.09 residents per unit**  **Total building occupancy = 2.09 residents per unit x 45 units = 94.05 people** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Occupancy Information Summary** | | | | |
| **Unit Type** | **Number of Units** | **Unit Occupancy Estimate** | | **Total Occupants per Unit Type** |
|  | **A** | **B** | | **= A x B** |
| 1 Bedroom |  | Multifamily Occupancy Estimate; or | 1.94 occupants |  |
| Low-Income Multifamily Occupancy Estimate | 2.26 occupants |
| 2 Bedroom |  | Multifamily Occupancy Estimate; or | 2.39 occupants |  |
| Low-Income Multifamily Occupancy Estimate | 2.83 occupants |
| 3 Bedroom |  | Multifamily Occupancy Estimate; or | 2.84 occupants |  |
| Low-Income Multifamily Occupancy Estimate | 3.40 occupants |
| 4 Bedroom |  | Multifamily Occupancy Estimate; or | 3.29 occupants |  |
| Low-Income Multifamily Occupancy Estimate | 3.97 occupants |
| **Total Property Occupants** | | | |  |

## Calculating Irrigated Area

Knowing the irrigated area is important because outdoor water use can represent a significant proportion of property water consumption. The irrigated area is the outdoor vegetated area that is regularly supplied with water. Typically, this includes landscaped areas that are irrigated with or without an in-ground/automatic irrigation system along with areas regularly watered by hand. If you have vegetated areas that were specifically landscaped to require no water at all, these may be included in your total. However, you cannot include hardscape or other nonvegetated surfaces such as patios, decks, sidewalks, and driveways.

If you do not enter an irrigated area, Portfolio Manager will use a default value of zero in order to calculate an EPA Water Score. If your property’s actual irrigated area is very small, this should not significantly impact your EPA Water Score. However, if your property’s irrigated area is larger or the property is located in a more arid part of the country, it could have the effect of depressing your EPA Water Score below what could be achieved. If your irrigated area is unknown, use one of the following methods to determine the value:

* Check to see if the area is available in the building records or building design documents
* Check service contracts of the property to find area of the landscape
* Deduct building area (footprint of the building) and hardscapes (e.g., pavement, parking area) from the total lot size of the property. Lot size may be available from tax records.
* Use a free online mapping tool, such as Google Earth or the website [www.freemaptools.com/area-calculator.htm](http://www.freemaptools.com/area-calculator.htm). Search for the location of the property, switch to satellite view, and follow the following instructions to use the area calculator tool:
  + Zoom and pan the map to find the landscape area of interest.
  + Click on the map to place a vertex for the polygon.
  + Continue to click as many times as necessary to define the polygon around your landscape area.
  + The area enclosed will provide estimated size of the landscaped area.

If the landscaped or irrigated area is not provided in square feet, use this conversion: 1 acre = 43,560 square feet.

**Submetering**

Few multifamily properties are submetered for water by a utility, but the very act of submetering has been shown to reduce overall property water use.

If your property is submetered, talk to your water utility or vendor about obtaining water use data for your whole property or for individual buildings within the property.

If your property is not submetered, consider working with a water utility or vendor to incorporate water submetering. Submetering encourages individual residents to conserve water, while also helping you recoup your utility costs from residents.

## Utility Bills and Rates

Gather at least one year’s worth of water and wastewater bills. It is possible that your wastewater could be billed by the same utility as your water provider or by a separate wastewater utility. Next, find at least one electric or natural gas (depending on your fuel for water heating) bill because some of your water-using equipment use hot water. If you don’t have these bills on hand, contact your water, wastewater, and energy utilities to provide this information.

Properties where water is centrally heated and/or the relevant energy source is paid by the property will realize additional cost savings from water efficiency measures. If water heating occurs in individual units, and energy bills are solely paid by individual residents, the associated energy savings will not contribute to your property’s cost savings. They will, however, provide valuable savings to your residents. Using the prevailing local energy rate can let you estimate this benefit.

Key items to gather include:

* At least one year’s worth of water supply and wastewater bills.
* At least one electric bill.
* At least one natural gas bill (if used to heat your water).

Look at your water and wastewater, electricity, and/or natural gas bills to determine your rates in cost per unit ($/unit). You may be billed in one of several units:

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| --- | --- | --- | --- |
| **Potential Water and Wastewater Rate Units:** | **Potential Electricity Rate Units:** | | **Potential Natural Gas Rate Units:** |
| * Cost per gallon ($/gal) * Cost per thousand gallons ($/Kgal) * Cost per cubic foot ($/cf) * Cost per hundred cubic feet ($/ccf) * Cost per thousand cubic feet ($/kcf) * Cost per liter ($/L) * Cost per acre-feet ($/ac-ft) * Flat rate | * Cost per kilowatt-hour ($/kWh) * Cost per megawatt-hour ($/MWh) * Cost per thousand British thermal units ($/kBtu) * Cost per million Btu ($/MMBtu) | | * Cost per million cubic feet ($/MMcf) * Cost per thousand cubic feet ($/Mcf) * Cost per hundred cubic feet ($/ccf) * Cost per cubic foot ($/cf) * Cost per cubic meter ($/m3) * Cost per thousand Btu ($/kBtu) * Cost per million Btu ($/MMBtu) * Cost per Therm ($/Therm) |
| **Utility Rate Data Required** | | **Facility-Specific Data**  **(including units of measurement)** | |
| Water Rate[[4]](#footnote-4) | |  | |
| Wastewater Rate4 | |  | |
| Electricity Rate4 | |  | |
| Natural Gas Rate4 | |  | |

## Additional Notes

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# Worksheet 2: Metering and Billing

Use the following worksheet to collect the information necessary to enter meter information and water consumption data into [ENERGY STAR® Portfolio Manager®](http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager).

## Water Meter and Water Use Data

Water meter/use information is required for Portfolio Manager to generate the EPA Water Score. In addition, entering your water meter and water use information provided on your water bills will help you track your water use over time and facilitate recordkeeping. Based on your water bills or from a site walk-through, record the meter identification numbers, if provided. In addition, give each meter a name and describe its service area, water source, use type (i.e., indoor, outdoor, or mixed indoor/outdoor), and units (e.g., thousand gallons [Kgal], hundred cubic feet [ccf]). For example, a meter servicing an outdoor landscape might be named “Irrigation.” If you are manually reading your water meter, be sure to note the units and any static zeros.

Portfolio Manager can also be used to track submetered water. Submetering uses such as cooling towers, HVAC systems, boiler systems, irrigation systems, or pool make-up water lines can be an excellent management practice, but are not necessary to capture whole property water use (as the primary meters will capture this use). Portfolio Manager allows you to deselect submeters when analyzing total facility water use.

*Example water meters, with differences in units and static zeros outlined in red.*

| **Water Meter Information** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Meter Name** | **Meter Identification Number** | **Service Area** | **Water Source (Municipally Supplied Potable Water, Municipally Supplied Reclaimed Water, Well Water, or Other)** | **Use Type (Indoor, Outdoor, or Mixed)** | **Units** |
| *Example* | *1234-AB-5678* | *First Floor* | *Municipally Supplied Potable Water* | *Indoor* | *Kgal* |
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Enter your water use information into Portfolio Manager (either via the online tool or via one of the [spreadsheets provided by ENERGY STAR](https://portfoliomanager.zendesk.com/hc/en-us/articles/115000108552)). In addition to providing the EPA Water Score, Portfolio Manager automatically plots your data over time to help identify and analyze water use trends. Plotting and analyzing your data monthly can help to identify seasonal water use patterns, leaks, malfunctioning equipment, or other issues.

**Send Utility Data Straight to ENERGY STAR Portfolio Manager**

Some water utilities, such as the New York City Department of Environmental Protection and the Los Angeles Department of Water and Power, are capable of automatically populating water use data into Portfolio Manager. Contact your local water utility to determine if it provides this type of service, as it can save you from having to enter meter and billing data.

| **Metered Water Usage Information** | | | | |
| --- | --- | --- | --- | --- |
| **Start Date (Required)** | **End Date**  **(Required)** | **Usage**  **(Required)** | **Cost (Optional)** | **Is This An Estimate (Required) (Yes/No)** |
| *Example:*  *1/1/2017* | *1/31/2017* | *121* | *$750* | *No* |
|  |  |  |  | Y or N? |
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|  |  |  |  | Y or N? |

Do not forget to track supplemental meters that may be associated with irrigation systems, water features, pools, cooling towers, or boilers. Tables to track these metered usages can be found in the respective worksheets associated with that use.

## Additional Notes

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# Worksheet 3: Bathroom Suite

Toilets, faucets, showerheads, and other sanitary fixtures in bathrooms typically represent the largest percentage of water use in multifamily properties, and therefore offer a clear opportunity for improving water efficiency. Use the following worksheet to collect information on bathroom fixtures installed within residential unit bathrooms. Collecting this information will help you identify opportunities for installing more efficient fixtures. Review WaterSense’s [*Bathroom Suite Water Efficiency Management Guide*](https://www.epa.gov/sites/production/files/2017-10/documents/ws-commericalbuildings-waterscore-bathroom-resource-guide.pdf) for more information.

## Getting Started

To complete the tables in this worksheet, conduct a full inventory of all toilets, faucets, showerheads, and bath and shower diverters located in bathrooms of each residential unit. The “Number Installed” column in each table should reflect the entire sum of these fixtures from all residential bathrooms in your building. However, these tables can also be used to assess a section of the property or an individual unit if you do not intend to conduct a full property water assessment at this time. Be aware that fixture types can vary significantly between units, particularly if a renovation has occurred for only some of the residential units or bathrooms, or if certain units have new fixtures due to previous malfunctions. Be sure to visit at least one representative unit for each replacement or renovation phase to obtain an accurate inventory. If the resources are available, consider visiting every residential unit, even if you are confident in the fixtures that are installed in each, as this provides an opportunity to check for leaks and other malfunctions.

An Additional Notes section is provided at the end of the worksheet to comment on any fixture leaks, malfunctions, or scale build-up that should be immediately resolved.

## Toilets

**Water-Saving Tip:** While leaks from worn toilet flappers may be hard to detect, even small leaks can waste approximately 30 gallons of water per day and 900 gallons per month. During your assessment, perform dye tests in tank-type toilets to look for worn flappers. Drop a dye tablet or several drops of diluted food coloring into the toilet tank. After 10 minutes, check if the dye leaked into the bowl (if it has, there is likely a leak). Flush the toilet immediately after conducting this test to prevent staining.

Complete the table below to capture information about toilets in all of your residential unit bathrooms. Consider the following when assessing your toilets:

* **Tank-type toilets:** Toilets equipped with a tank that stores and dispenses water to the bowl when flushed. This is the most common type of toilet in residential settings.
* **Flushometer-valve toilets:** Toilets attached to a valve activated by a lever or sensor that releases pressurized water to the bowl.

Flush volumes in gallons per flush (gpf) are typically found on the underside of the tank lid for tank-type fixtures. For flushometer-valve toilets, find the flush volume marked on the toilet fixtures. For dual-flush toilets, which flush at different volumes depending upon the need to flush liquid or solid waste, enter the effective flush volume. Assume the effective flush volume of a dual flush toilet = ([2 x low flush volume] + [1 x high flush volume]) / 3].

**Water-Saving Tip:** Stock and use flushometer-valve inserts that have a rated flush volume consistent with the manufacturer specifications for the toilet bowl. You can typically find the flush volume on the box of the flushometer-valve insert and marked somewhere on the toilet fixture. Matching the flush volume of the valve and bowl ensures the best flushing performance.

If the flush volume of existing toilets is unknown, use the information in the table below to estimate the existing flush volume based on the date of installation/initial construction.

**Assumed Toilet Flush Volume Based on Toilet Age**

|  |  |
| --- | --- |
| **Existing Toilet Age** | **Toilet Flush Volume** |
| Installed From 1994 to Present | 1.6 gallons per flush |
| Installed Between 1977 and 1994 | 3.5 gallons per flush |
| Installed Before 1977 | 5.0 gallons per flush |

| **Toilets Installed in Residential Bathrooms** | | | |
| --- | --- | --- | --- |
| **Location (e.g., floor, unit numbers)** | **Toilet Type (tank-type or flushometer-valve)** | **Number Installed** | **Existing Flush Volume (gpf)** |
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## Bathroom Sink (Lavatory) Faucets

**Water-Saving Tip:** During the assessment, check for leaky faucets and showerheads. Every fixture that drips at a rate of one drip per second could waste nearly 3,200 gallons per year. Have your maintenance staff fix all leaks as soon as possible.

Complete the table below to capture information about faucets in all of your residential unit bathrooms. Consider the following when assessing your faucets:

* Be sure to account for all faucets in bathrooms with multiple sinks.
* The faucet flow rate in gallons per minute (gpm) is typically found etched into the faucet aerator, but can also be visible on the faucet body of some models.
* If the flow rate is not visible on the faucet or faucet aerator, the flow rate can be determined using this simple procedure:
* Turn on the faucet to its full operating position.
* Place a container under the faucet and collect water for 10 seconds.
* Measure the volume of water collected in the container. Convert to gallons if necessary.
* Multiply the measured volume of water by 6 to calculate the flow rate in gpm [e.g., (0.35 gallons collected in 10 seconds x 6) = 2.1 gpm].
* Even if the flow rate is marked on the faucet, consider verifying the flow rate using the method described above to ensure a tenant hasn’t tampered with the aerator.

**Faucets in public restrooms:** Public-use faucets are those intended for use by more than one individual (i.e., employees, visitors, other building occupants) such as in common areas. Public-use faucets should have aerators with a maximum flow rate of 0.5 gpm or, for metering faucets, 0.25 gallons per operating cycle. If aerator removal is a common problem, consider installing tamper-proof aerators to prevent tenants from removing them.

* If a lavatory faucet’s aerator is not labeled with its rated flow rate, and if testing the flow rate of each faucet during the assessment is not feasible, a default flow rate of 2.2 gpm can be used for faucets. However, providing data specific to the bathrooms within your property will yield more accurate savings estimates and project payback periods.
* Note any visible scale build-up on the faucet aerator, as scale can hinder performance. Remove any scale buildup that has accumulated, if possible, or consider replacing the faucet aerator with a WaterSense labeled model flowing at 1.5 gpm or less.

| **Flow Rate of Lavatory Faucets in Residential Bathrooms** | | |
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| **Location (e.g., floor, unit numbers)** | **Number Installed** | **Existing Flow Rate (gpm)** |
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## Showerheads

Complete the table below to capture information about showerheads in all of your residential unit bathrooms. Consider the following when assessing your showerheads:

* The showerhead flow rate in gpm is typically marked on the showerhead. If it is not, the flow rate can be determined using this simple procedure:
* Turn the showerhead on.
* Place a bucket or container under the showerhead and collect water for 30 seconds.
* Measure the volume of water collected in the container. Convert to gallons if necessary.
* Multiply the measured volume of water by 2 to calculate the flow rate in gpm [e.g., (1.25 gallons collected in 30 seconds x 2) = 2.5 gpm].
* Even if the flow rate is marked on the showerhead, consider verifying the flow rate using the described method above to ensure a tenant hasn’t tampered with the showerhead to remove the flow restrictor.
* Note any visible scale build-up on the showerhead, as scale can hinder performance. Remove any scale building that has accumulated, if possible, or otherwise replace the showerheads with a WaterSense labeled model flowing at 2.0 gpm or less.
* If a showerhead is not labeled with its rated flow rate, and if testing the flow rate of each showerhead during the assessment is not feasible, a default flow rate of 2.5 gpm can be used for showerheads. However, providing data specific to the bathrooms within your property will yield more accurate savings estimates and project payback periods.

| **Flow Rate for Showerheads in Residential Bathrooms** | | |
| --- | --- | --- |
| **Location (e.g., floor, unit numbers)** | **Number Installed** | **Existing Flow Rate (gpm)** |
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## Bath and Shower Diverters

**Water-Saving Tip:** A bath and shower diverter that leaks 0.1 gallons per minute can waste the average family 650 gallons of water, 79 kilowatt-hours of electricity, and more than $15 in water and electricity costs per year.

Complete the table below to capture information about leaking bath and shower diverters. Bath and shower diverters are devices used to divert the flow of water either towards the tub spout (i.e., the bathtub) or toward a showerhead in a combination tub-shower.

Many bath and shower diverters continuously leak a small amount of water from the tub spout while they are engaged, and water is being diverted from the bathtub to the showerhead. Over time, the magnitude of these diverter leaks can increase substantially, resulting in significant water waste passed down the drain with every shower. In addition, because much of this water is heated, leaking bath and shower diverters can result in additional wasted energy.

Consider the following when assessing bath and shower diverters:

* Measure the leak rate using this simple procedure:
* Turn on the water and activate the diverter such that water is flowing out of the showerhead and not the tub spout.
* Wait 60 seconds to allow residual water in the diverter to drip out of the tub spout.
* Place a container under the tub spout for 60 seconds and collect any water that is leaking.
* Measure the volume of water collected in the container. Convert to gallons if necessary.

| **Leak Rate for Bath and Shower Diverters in Residential Bathrooms** | | |
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| **Location (e.g., floor, unit numbers)** | **Number Installed** | **Existing Leak Rate (gpm)** |
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## Additional Notes

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# Worksheet 4: Kitchen and Laundry

Use the following worksheet to collect information on water-using kitchen and laundry fixtures and appliances (i.e., kitchen faucets, dishwashers, clothes washers) installed within residential units or in building laundry rooms. Collecting this information will help you identify opportunities for installing more efficient models. For more information on kitchen and laundry fixtures and appliances, review WaterSense’s [*Kitchen and Laundry Water Efficiency Management Guide*](https://www.epa.gov/sites/production/files/2017-10/documents/ws-commercialbuildings-waterscore-residential-kitchen-laundry-guide.pdf).

## Getting Started

To complete the tables in this worksheet, conduct a full inventory of all kitchen faucets, dishwashers, and clothes washers (both in-unit and in common areas).

An Additional Notes section is provided at the end of the worksheet to comment on any leaks, malfunctions, or scale build-up that should be immediately resolved. In addition to fixtures and appliances discussed in this section (i.e., kitchen faucets, dishwashers, and clothes washers), water leaks can also occur in the water line running to a refrigerator if the refrigerator has an integrated ice machine or water spout.

## Kitchen Faucets

Complete the table below to capture information about faucets in residential unit kitchens. Consider the following when assessing your faucets:

**Water-Saving Tip:** While WaterSense does not currently label kitchen faucets, most green building and plumbing codes require kitchen faucets to have a flow rate of 1.8 gpm or less, reducing the maximum flow rate from a standard kitchen faucet by at least 18 percent.

* The faucet flow rate in gallons per minute (gpm) can be found etched into the faucet aerator or is visible on the faucet body of some models.
* If the flow rate is not visible on the faucet or faucet aerator, the flow rate can be determined using this simple procedure:
* Turn on the faucet to its full operating position.
* Place a container under the faucet and collect water for 10 seconds.
* Measure the volume of water collected in the container. Convert to gallons if necessary.
* Multiply the measured volume of water by 6 to calculate the flow rate in gpm [e.g., (0.35 gallons collected in 10 seconds x 6) = 2.1 gpm].
* If a kitchen faucet’s aerator is not labeled with its rated flow rate, and if testing the flow rate of each faucet during the assessment is not feasible, a default flow rate of 2.2 gpm can be used for kitchen faucets. However, providing data specific to the kitchen faucets within your property will yield more accurate savings estimates and project payback periods.

| **Flow Rate of Faucets in Residential Kitchens** | | |
| --- | --- | --- |
| **Location (e.g., floor, unit numbers)** | **Number Installed** | **Existing Flow Rate (gpm)** |
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## Dishwashers

Complete the table below to capture information about dishwashers installed in all of residential unit kitchens. Consider the following when assessing dishwashers:

* While the gallons per cycle water consumption is not likely to be labeled on a dishwasher, this information can be found in online product information or in manufacturer specification sheets (simply note the manufacturer and model number of the dishwasher).
* Similarly, if the ENERGY STAR label is not shown on the product itself, use the manufacturer and model number to find product information (e.g., specification sheet, marketing brochure) to identify whether the product has earned the ENERGY STAR. Also consider using the ENERGY STAR Product Finder ([www.energystar.gov/productfinder/](http://www.energystar.gov/productfinder/)), although this list may not include older models that are either no longer on the market or met a previous version of the ENERGY STAR Program Requirements for Residential Dishwashers.
* To help compare the performance of existing dishwashers installed in your building, ENERGY STAR’s current water performance requirements for dishwashers allow a maximum water consumption of 3.5 gallons per cycle for standard dishwashers and 3.1 gallons per cycle for compact dishwashers.[[5]](#footnote-5)

| **Inventory of Dishwashers Installed in Residential Kitchens** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Location (e.g., floor, unit numbers)** | **Manufacturer** | **Model Number** | **Gallons per Cycle (gpc)** | **Number Installed** | **ENERGY STAR Certified?**  **(yes or no)** | **Approx. Age (years)** |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |
|  |  |  |  |  | Y or N? |  |

## Clothes Washers

Complete the table below to capture information about clothes washers installed (both in residential units and common areas). Consider the following when assessing clothes washers:

**Water-Saving Tip:** For multi-load/commercial clothes washers located in common areas, preset washers to meet a water factor of 8 gallons per cubic foot of capacity or less.

* While the integrated water factor (IWF)[[6]](#footnote-6) or gallons of water used per load is not likely to be labeled on a clothes washer, this information can be found online in product information or in manufacturer specification sheets (simply note the manufacturer and model number).
* Similarly, if the ENERGY STAR label is not shown on the product itself, use the manufacturer and model number to find product information (e.g., specification sheet, marketing brochure) to identify whether the product has earned the ENERGY STAR. Also consider using the ENERGY STAR Product Finder ([www.energystar.gov/productfinder/](http://www.energystar.gov/productfinder/)), although this list may not include older models that are either no longer on the market or were certified under a previous version of the ENERGY STAR Program Requirements for Clothes Washers.
* To help compare the performance of existing clothes washers installed in your building, ENERGY STAR’s current water performance requirements for clothes washers are summarized in the table below.

**ENERGY STAR IWF Requirements for Clothes Washers[[7]](#footnote-7)**

|  |  |
| --- | --- |
| **Clothes Washer Type** | **Maximum IWF** |
| Residential Clothes Washers, Front-Loading (> 2.5 cubic feet) | 3.2 |
| Residential Clothes Washers, Top-Loading (> 2.5 cubic feet) | 4.3 |
| Residential Clothes Washers (≤ 2.5 cubic feet) | 4.2 |
| Commercial Clothes Washers[[8]](#footnote-8) | 4.0 |

| **Inventory of Clothes Washers in Residential Units and/or Common Areas** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Location (e.g., floor, unit numbers)** | **Equipment Type (top-loading or front-loading)** | **Manufacturer** | **Model Number** | **IWF or Gallons per Load** | **Number Installed** | **ENERGY STAR Certified?**  **(yes or no)** | **Approx. Age (years)** |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
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|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |
|  |  |  |  |  |  | Y or N? |  |

## Additional Notes

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# Worksheet 5: Landscaping and Irrigation

Use the following worksheet to collect information on your property’s irrigation system and water features. Collecting this information will help you identify opportunities for implementing more efficient methods, irrigation equipment, and other features. This worksheet will also help you estimate your property’s “irrigated area,” defined as the amount of outdoor vegetated area that is supplied with water regularly.[[9]](#footnote-9) For more information on irrigation and landscaping, review WaterSense’s [*Landscaping and Irrigation Water Efficiency Management Guide*](https://www.epa.gov/sites/production/files/2017-12/documents/ws-commercialbuildings-waterscore-irrigation-landscape-guide.pdf).

While this worksheet helps identify existing irrigation equipment and some high-level opportunities for savings, it does not replace the knowledge gained from conducting a full-scale irrigation audit. If the property’s landscape is sizeable, located in a hot and dry climate, or the irrigation system has not been inspected recently, WaterSense recommends hiring an irrigation professional that has been [certified by a WaterSense labeled program](https://www.epa.gov/watersense/irrigation-pro). A certified irrigation professional can:

* Audit an existing system to ensure it is performing efficiently.
* Design a new system to best suit the landscape and account for local climate conditions.
* Install, maintain, and repair your irrigation equipment and ensure proper scheduling of the irrigation system to optimize performance.

WaterSense recommends conducting a full audit of the irrigation system every three years.

## Getting Started

Complete the table below to capture information about your property’s irrigation system and its associated water use. Consider the following when assessing your irrigation controller(s):

**Water-Saving Tip:** Check the performance of your irrigation system by confirming that all sprinkler heads are functioning properly. Make sure that sprinkler heads aren’t watering walkways, roads, fences, or other non-landscaped areas. Adjust sprinkler heads and/or fix broken parts as soon as possible.

* **Manually activated irrigation system:** Requires the user to begin and end watering cycles by physically turning it on and off.
* **Timer-based irrigation controller:** Equipped with a clock timer that waters landscape using a pre-determined schedule.
* **Timer-based irrigation controller with a rain sensor:** Equipped with a clock timer that waters landscape using a pre-determined schedule and includes a rain sensor that stops irrigation from occurring during or following a rain event.
* **Weather-based irrigation controller:** Uses local weather conditions to adjust irrigation watering schedules to account for actual needs of the landscape.
* **Soil moisture-based irrigation controller:** Controls whether the irrigation system operates by measuring the amount of moisture in the soil and tailoring irrigation schedules accordingly.

In some cases, there may be multiple types of irrigation controllers that are programmed to irrigate different zones.

| **Landscaping and Irrigation Water Use Assessment** | |
| --- | --- |
| **Data Request** | **Facility-Specific Data** |
| **Irrigation System** | |
| What is your irrigation system pressure?[[10]](#footnote-10) |  |
| Do your sprinkler bodies have integral pressure regulation? (Note: WaterSense labeled models include this feature.) | Y or N? |
| What type of irrigation controller(s) are used to control irrigation for a majority of your landscape? (circle one) | Manually activated  Timer-based irrigation controller  Timer-based irrigation controller with a rain sensor  Weather-based irrigation controller  Soil moisture-based irrigation controller |
| For manual and timer-based irrigation controllers, what irrigation schedule is used? |  |
| How frequently do you or your irrigation contractor monitor and adjust your irrigation controller and schedule?[[11]](#footnote-11) |  |
| **Water Feature(s)** | |
| Do all decorative water features (e.g., fountains, waterfalls) use recirculating water? (yes or no) | Y or N? |
| Are all decorative water features automatically turned off at night or when otherwise not needed? (yes or no) | Y or N? |

## Operations and Maintenance (O&M) Checklist

Utilize the following checklist to determine if your irrigation system and landscape are being maintained as efficiently as possible.

If you use a landscaping or irrigation contractor, consider providing this checklist to the contractor to complete, or talk to your vendor about implementing these best management practices.

| **Landscaping and Irrigation System O&M Checklist** | | | |
| --- | --- | --- | --- |
|  | **Complete** | **In Progress** | **Not Applicable/**  **Not Interested** |
| **Landscape** | | | |
| Incorporate water savings, chemical use, and energy-efficient requirements/ performance standards into all landscape and irrigation service and maintenance agreements. |  |  |  |
| Use mulch (3”) around trees and plant beds. |  |  |  |
| Remove weeds from any irrigated landscape so water is available for the desired landscaping; pull weeds manually instead of using herbicides. |  |  |  |
| Raise the blade on mowers to allow grass to grow longer and more drought-resistant. |  |  |  |
| Plant additional trees and shrubbery to increase the amount of shaded area. |  |  |  |
| **Irrigation System** | | | |
| Have an irrigation professional certified by a WaterSense labeled program conduct a full audit of the irrigation system every three years. |  |  |  |
| Ensure the irrigation schedule is appropriate for climate, soil conditions, plant materials, grading, and the season. |  |  |  |
| Inspect and repair all irrigation system parts and components regularly as part of standard maintenance procedures. Repair all broken sprinkler heads immediately. |  |  |  |
| Check the position and location of sprinkler heads to ensure that they are working properly and water is not being directed onto non-landscaped areas such as sidewalks. |  |  |  |
| **Water Features** | | | |
| Shut off water features when possible to reduce evaporation losses and check water recirculation systems annually for leaks and other damage. |  |  |  |

## Irrigation and/or Decorative Water Feature Submetering

Installing and monitoring a submeter on the water line(s) to the irrigation system and/or landscape water features can help identify leaks. In addition, by collecting periodic meter readings, you can determine how much water is typically being used to maintain the landscape and strive to make improvements to reduce the total water use.

If the irrigation make-up water line is submetered, use the template below to monitor submeter readings. Enter meter readings into [ENERGY STAR® Portfolio Manager](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager)® for easy tracking and trending.

| **Landscape/Irrigation Meter Reading Log** | | | |
| --- | --- | --- | --- |
| **Irrigation Zone  (if applicable)** | **Date** | **Meter/Submeter Reading** | **Units** |
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## Additional Notes

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# Worksheet 6: Pools

Use the following worksheet to understand if your property’s pool(s) and/or spa(s) are operating as efficiently as possible.

## Getting Started

Complete the table below to capture information about pool(s) on the property and their associated water use. If there are multiple pools or spas, add the values together to get the total surface area and volume. Consider the following when assessing pool or spa filtration system(s):

* **Sand filter:** Uses sand, zeolite, or crushed recycled glass as the filter media. As pool or spa water passes through the media, particulates are removed. Sand filters can use a significant amount of water for backwashing, which is the process to regularly clean and flush trapped particulates out of the system to restore the filter’s cleaning capacity.
* **Sorptive media or pre-coat filter:** Uses diatomaceous earth (DE), cellulose, or perlite as the filter media. Sorptive media filters use less water for backwashing, but the media must be replenished after each backwash, as it is purged from the filter grid along with the debris.
* **Cartridge unit:** Uses pleated filters made from paper-type material that can be reused or disposed. Since these filters do not need to be backwashed, they are the most water-efficient type available for all but the largest pools.
* **Industrial filter:** Uses a specific type of sorptive media filter that can be recycled up to 30 times before the media is discarded and replaced. Industrial filters recycle the water used to backwash the filter. These types of filters are only used for the largest commercial pools.

|  |  |  |
| --- | --- | --- |
| **Pool and Spa Water Use Assessment** | | |
|  | **Pool(s)** | **Spa(s)** |
| **What is the square footage of the surface?** |  |  |
| **What is the volume in gallons?** |  |  |
| **How many days per year is it operating?** |  |  |
| **Is a cover used when not in use?** |  |  |
| **What type of filtration system is installed? (circle one)** | Sand filter  Sorptive media filter  Cartridge unit  Industrial or pre-coat filter | Sand filter  Sorptive media filter  Cartridge unit |

## Operations and Maintenance (O&M) Checklist

**Water-Saving Tip:** Evaporation losses can be reduced by 30 to 50 percent by using pool covers and 10 to 30 percent with liquid evaporation barriers.

Utilize the following checklist to determine if your pool is being operated and maintained as efficiently as possible.

If you use a pool vendor to perform maintenance (e.g., maintain filters and water chemistry), consider providing this checklist to the vendor to complete, or talk to your vendor about implementing these best management practices.

|  |  |  |  |
| --- | --- | --- | --- |
| **Pool and Spa O&M Checklist** | | | |
|  | **Complete** | **In Progress** | **Not Applicable/**  **Not Interested** |
| **Reduce Evaporation** | | | |
| Avoid heating pools above 79°F to minimize evaporation. |  |  |  |
| Cover pool when not in use. |  |  |  |
| Utilize a liquid evaporation barrier. |  |  |  |
| Limit use of sprays, waterfalls, etc. |  |  |  |
| Reduce wind movement across the water by using fences, walls, non-shedding hedges, or other barriers. |  |  |  |
| **Reduce Splashing** | | | |
| Maintain the water level a few inches below the top of the pool to reduce splashing. |  |  |  |
| **Identify Leaks and Minimize Drainage** | | | |
| Monitor the water level regularly—if a pool is losing more than 2” per week, a leak is likely present. |  |  |  |
| Maintain proper pool chemistry to limit pool cleaning and drainage events. |  |  |  |
| **Filter Cleaning and Maintenance** | | | |
| Clean filter media only as necessary and not on a set schedule. Review the pool filter pressure gauge. When filter pressure has increased 5 to 10 psi, it is time clean/backwash the filter. |  |  |  |
| Install and utilize a sight glass to monitor the visual quality of backwash water running through the filter to determine when backwashing is complete (rather than backwashing for a predetermined amount of time). Backwashing is complete once the water that passes through the sight glass is clear and free of particulates. |  |  |  |

## Pool Submetering

Installing and monitoring a submeter on the pool’s make-up line can help identify leaks. By collecting periodic meter readings, you can determine how much water is typically needed to maintain the pool water level. If any anomalies occur, it could be the sign of a leak or other malfunction.

If your pool make-up water line is submetered, use the template below to monitor submeter readings. Enter meter readings into [ENERGY STAR® Portfolio Manager](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager)® for easy tracking and trending.

| **Pool Meter Reading Log** | | |
| --- | --- | --- |
| **Date** | **Meter/Submeter Reading** | **Units** |
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## Additional Notes

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# Worksheet 7: Heating, Ventilation, and Air Conditioning (HVAC) and Mechanical

Use the following worksheet to verify that your property’s mechanical systems, such as cooling towers and boilers, are using water efficiently. For more information on mechanical systems, review WaterSense’s [*Mechanical Systems Water Efficiency Management Guide*](https://www.epa.gov/sites/production/files/2017-12/documents/ws-commercialbuildings-waterscore-mechanical-systems-guide.pdf).

## Getting Started

To complete the tables in this worksheet, conduct a full inventory of all cooling towers, steam boilers, and equipment cooled with single-pass potable water within the property.

## Cooling Towers

Cooling towers evaporate water to remove heat from the system. Water is also discharged (i.e., blown down) to prevent mineral build-up and scaling in the tower. Make-up water is provided to replace water that is lost in the system.

**Water-Saving Tip:** Using drift eliminators on your cooling tower helps reduce water losses from “drift” and splashing to negligible amounts. Newer drift eliminators can reduce drift to less than 0.005 percent of the recirculating water volume, compared to 0.05 to 0.2 percent of the flow rate when drift eliminators are not installed.

Many facilities use chemicals or other water treatment to control mineral buildup and scaling in cooling towers. A maintenance and/or water chemistry vendor may be contracted with to provide chemicals and monitor the equipment to ensure it is operating correctly. Water chemistry reports, which are typically provided during or shortly after the vendor’s periodic visits, might include the cycles of concentration of your cooling tower(s), as well as the total dissolved solids (TDS) or conductivity of make-up and blowdown water. Since TDS enter the system in the make-up water and exit the system in the blowdown water, the cycles of concentration are also approximately equal to the ratio of volume of make-up water to blowdown water. Therefore, cycles of concentration are a parameter commonly used to evaluate cooling tower operation efficiency. To the extent possible, the cycles of concentration of a cooling tower should be maximized.

**Water-Saving Tip:** Increasing a cooling tower’s cycles of concentration from three to six reduces cooling tower make-up water by 20 percent.

Complete the table below to capture information about your building’s cooling tower system.

| **Cooling Tower Water Use Assessment** | |
| --- | --- |
| **Data Request** | **Facility-Specific Data** |
| What is the capacity of the cooling tower(s), expressed as total tons of cooling?[[12]](#footnote-12) |  |
| How is cooling tower discharge (blowdown) controlled? (circle one) | Manually not based on conductivity  Manually based on conductivity  Timer-based control  Automatic control based on conductivity |
| Do you know the cycles of concentration?  (yes or no)[[13]](#footnote-13) | Y or N? |
| What are the existing cooling tower’s cycles of concentration? |  |
| Is cooling tower water treatment used to control scale build-up? (yes or no)[[14]](#footnote-14) | Y or N? |
| If so, what is the total dissolved solids (TDS) or conductivity of the make-up water? |  |
| If so, what is the TDS or conductivity of the discharge (blowdown) water? |  |

## Single-Pass Cooling

Determine if any of your property operates equipment that uses single-pass cooling water. Types of equipment that might use single-pass cooling include ice machines, point-of-use chillers, refrigeration systems, air conditioners, and air compressors.

**Water Saving Tip:** If replacing single-pass-cooled equipment with air-cooled models is not possible or economically viable, consider installing a solenoid valve that supplies cooling water only when needed.

Complete the table below to capture information about equipment cooled with single-pass cooling water. If the flow rate of cooling water through the equipment is unknown, the flow rate can be determined using this simple procedure:

* Locate the floor drain where the cooling water is discharging.
* Place a container under the cooling water stream and collect water for 10 seconds.
* Measure the quantity of water collected in the container. Convert to gallons if necessary.

Multiply the measured quantity of water by 6 to calculate the flow rate in gallons per minute (gpm) [e.g., (0.25 gallons collected in 10 seconds x 6) = 1.5 gpm].

| **Single-Pass Cooling Water Use Assessment** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Location** | **Equipment Cooled** | **Flow Rate (gpm)** | **Operating Schedule[[15]](#footnote-15)** | | | |
| **Minutes/Hour** | **Hours/Day** | **Days/Week** | **Weeks/Year** |
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## Operations and Maintenance (O&M) Checklist

Utilize the following checklist to determine if your mechanical systems are being operated and maintained as efficiently as possible.

If you use a water treatment vendor to maintain cooling tower and boiler performance, consider providing this checklist to the vendor to complete, or talk to your vendor about implementing these best management practices.

| **Mechanical Systems O&M Checklist** | | | |
| --- | --- | --- | --- |
|  | **Complete** | **In Progress** | **Not Applicable/**  **Not Interested** |
| **Single-Pass Cooling** | | | |
| Use the minimum flow rate required to cool the system recommended by the manufacturer. |  |  |  |
| Regularly check operation of any water control valves to ensure cooling water is only flowing when there is heat load on the equipment. |  |  |  |
| Keep coil loops clean to maximize heat exchange. |  |  |  |
| **Cooling Towers** | | | |
| Properly maintain and clean heat exchangers, condensers, and evaporator coils to prevent scale, biological growth, and sediment from building up in the tubes. |  |  |  |
| Properly insulate all piping, chillers, and storage tanks. |  |  |  |
| Regularly read the conductivity meter and the make-up and blowdown flow meters to quickly identify problems and determine when to make adjustments. |  |  |  |
| Keep a detailed log of make-up and blowdown quantities, conductivity, and cycles of concentration and monitor trends to spot deterioration in performance. |  |  |  |
| Make sure the cooling tower fill valve cuts off cleanly when the tower basin is full to minimize wasted water from leaks. |  |  |  |
| Work with your cooling tower water treatment vendor to maximize the cycles of concentration. |  |  |  |
| **Steam and Hot Water Boilers** | | | |
| Maintain boilers, steam lines, and steam traps by doing the following:   * Check steam and hot water lines for leaks * Clean and inspect boiler water and fire tube * Identify and repair leaking steam traps. |  |  |  |
| Make sure the boiler fill and blowdown valves cut off cleanly to minimize wasted water from leaks. |  |  |  |
| Inspect steam traps for leaking condensation. |  |  |  |
| Work with your water treatment vendor to maximize the cycles of concentration. |  |  |  |
| **General** | | | |
| Monitor floor drains and investigate unknown sources of water. This is an easy way to identify leaks or other equipment inefficiencies. |  |  |  |

## Cooling Tower and Boiler Submetering

Installing and monitoring submeters on the cooling tower and boiler make-up and blowdown water lines help verify operating cycles of concentration and identify leaks or inefficiencies. By collecting periodic meter readings, you can determine how much make-up water is typically needed for cooling tower and boiler operations. If any anomalies occur, it could be the sign of a leak or other malfunction.

If your cooling tower and/or boiler make-up and/or blowdown water lines are submetered, use the template below to log submeter readings. Enter meter readings into [ENERGY STAR® Portfolio Manager](https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager)® for easy tracking and trending.

| **Cooling Tower or Boiler Meter Reading Log** | | | | |
| --- | --- | --- | --- | --- |
| **Date** | **Make-Up  Meter Reading** | **Units** | **Blowdown Meter Reading** | **Units** |
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## Additional Notes

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# Appendix A: Summary of Needed Repairs and Replacement Items

This appendix can be used to summarize immediate repairs or replacement items that are identified during your water assessment. Items noted in the Additional Notes section of each worksheet can be compiled into the table below for reporting to the property owner or disseminating to maintenance staff for resolution.

| **Summary of Needed Repairs and Replacement Items** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Item Number** | **Location** | **Item Name** | **Reason for Needed Repair/ Replacement** | **Estimated Repair/ Replacement Cost ($)** | **Repair Timeframe** | **Completion Date** |
| *Example* | *Unit 201* | *Aerator in master bathroom.* | *Aerator is missing. Purchase WaterSense labeled faucet aerator flowing at 1.5 gpm.* | *$5* | *Immediate* | *4/30/2018* |
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1. The EPA Water Score is only available for multifamily housing properties with 20 units or more. However, all multifamily buildings, regardless of size, can use these worksheets to complete a facility water assessment and use the associated [WaterSense Water Efficiency Management Guides](https://www.epa.gov/watersense/water-score-multifamily-housing) to identify water savings opportunities. [↑](#footnote-ref-1)
2. For information on how to estimate irrigated area, see Worksheet 5: Landscaping and Irrigation. [↑](#footnote-ref-2)
3. Florida Solar Energy Center. *Estimating Daily Domestic Hot-Water Use in North American Homes.* FSEC-PF-464-15. June 30, 2015. [www.fsec.ucf.edu/en/publications/pdf/FSEC-PF-464-15.pdf](http://www.fsec.ucf.edu/en/publications/pdf/FSEC-PF-464-15.pdf) [↑](#footnote-ref-3)
4. If utility rates are unknown, consider using national residential averages from 2016 for the water supply rate ($4.87/Kgal), wastewater rate ($6.15/Kgal), electricity rate ($0.1255/kWh), and natural gas rate ($10.06/Mcf); however, providing data specific to your building will yield more accurate savings estimates and project payback periods. [↑](#footnote-ref-4)
5. ENERGY STAR Program Requirements Product Specification for Residential Dishwashers. Eligibility Criteria Version 6.0. Effective January 29, 2016. [↑](#footnote-ref-5)
6. Defined as the quotient of the total weighted per-cycle water consumption for all wash cycles in gallons divided by the cubic foot capacity of the clothes washer. This metric is used in the ENERGY STAR product criteria and can be used to help identify products that use more or less water. The lower the integrated water factor, the more water efficient the clothes washer. [↑](#footnote-ref-6)
7. ENERGY STAR Program Requirements Product Specification for Clothes Washers. Eligibility Criteria Version 8.0. Effective February 5, 2018. [↑](#footnote-ref-7)
8. Soft-mounted front-loading or soft-mounted top-loading clothes washers designed for use in applications in which occupants of more than one household will be using the clothes washer, such as multifamily housing common areas and coin laundries. [↑](#footnote-ref-8)
9. Typically, this includes landscape areas that are irrigated with or without an in-ground/automatic irrigation system along with areas regularly watered by hand. If you have vegetated areas that were specifically xeriscaped to require no water at all, these may be included in your total. However, you cannot include hard/un-vegetated surfaces such as patios, decks, and driveways. [↑](#footnote-ref-9)
10. If you do not know your system pressure, work with your irrigation professional to take this measurement at the sprinkler outlets closest to and furthest away from the irrigation valve. [↑](#footnote-ref-10)
11. WaterSense recommends updating irrigation schedules regularly (as often as monthly) to account for changing weather conditions. [↑](#footnote-ref-11)
12. If cooling tower capacity is unknown, the typical cooling tower capacity is approximately equal to 1.25 times the chiller capacity (in tons). The chiller tons can likely be found on a nameplate or in other product literature. If there are multiple chillers and/or cooling towers servicing your property, add the tonnage ratings together to get the total tonnage of cooling. [↑](#footnote-ref-12)
13. If the water chemistry reports provided by your cooling tower water treatment provider do not include the cycles of concentration, or if you otherwise do not know how to calculate the cycles of concentration, see WaterSense’s [*Mechanical Systems Water Efficiency Management Guide*](https://www.epa.gov/sites/production/files/2017-12/documents/ws-commercialbuildings-waterscore-mechanical-systems-guide.pdf) for example calculations. [↑](#footnote-ref-13)
14. The TDS or conductivity of the make-up water and discharge (blowdown) water can be obtained from water chemistry reports provided by your cooling tower operations/treatment contractor. Make sure the units in which the TDS or conductivity are provided are the same for both measurements. TDS is typically provided in either milligrams per liter (mg/L) or parts per million (ppm). Conductivity is provided in microseimens per centimeter (µS/cm). [↑](#footnote-ref-14)
15. If the operating schedule of the single-pass cooling is unknown, assume the equipment operates 24 hours per day, seven days per week, 52 weeks per year. [↑](#footnote-ref-15)