WATER CENTRIC CITIES INITIATIVE

# INTRODUCTION TO COMMERCIAL RAINWATER HARVESTING

CITY OF MILWAUKEE

# MILWAUKEE IS A WATER CENTRIC CITY

Milwaukee is defined by water. People first settled here because of it, our history was shaped by it, and our future depends on it. At the confluence of three great rivers flowing into the largest freshwater resource on the planet, we're not just the Midwest. We're a Water Centric City on America's Fresh Coast, and rainwater harvesting-- or collecting rainwater to reuse on site-- is one major way you can help.

While our position along Lake Michigan seemingly provides us with an abundance of freshwater, the Great Lakes region is not immune to water scarcity. Meanwhile, too much water  from extreme rain events can also be damaging to our environment and the communities that depend on it. An excess of rainwater can flood our streets and basements and overload our wastewater treatment plants, potentially leading to combined sewer overflows (CSOs) that damage the health of our shared watersheds.

But by harvesting rainwater to reuse on your commercial property, you can reduce your organization's environmental footprint, lighten the load on our stormwater infrastructure, and show your community that you care about protecting and restoring our natural resources.

We at the City of Milwaukee have created this Commercial Rainwater Harvesting and Reuse Guide to support local water stewards as you begin to plan your project. While different systems will require different set ups, storage sizes, and filtration, all projects are crucial steps on our collective journey to becoming a Water Centric City.

For more information on Milwaukee's water initiatives visit **WaterCentricCity.org**

# APPLICATIONS

Rainwater harvesting projects come in many shapes and sizes, but the type of system and level of complexity is dependent on the end-use of the water you collect. Do you need enough water to wash your whole fleet of vehicles or just enough to water your flowers? Do you want to use the water you collect for manufacturing or will the water come in contact with food and people? These questions will help you decide what level of rainwater harvesting is right for you. Some common end uses include:

- Irrigation
- Flushing Toilets
- Cooling Towers
- Fire Suppression
- Manufacturing Processes
- Washing Vehicles
- Laundry
- Filling Pools

# RECOGNITION

Water scarcity is not only a serious issue for many countries around the world that face severe shortages and compromised water quality, but is a concern here in the Great Lakes region as well. And while some property owners pursue water reuse as a way to be more sustainable in the face of climate change threats, many others will look at water reuse projects to achieve points for a sustainable building or landscaping rating system. Some of the more common applications are highlighted below:

## LEED CERTIFICATION

If you are pursuing LEED (Leadership in Energy and Environmental Design) certification, a rainwater harvesting system may earn you points across several categories: reducing stormwater runoff, reducing polluted runoff, indoor and outdoor water use reduction, cooling tower water use, and reducing the use of potable water for landscape irrigation. Being LEED Certified gives your building instant recognition, a higher resale value, and a healthier environment for occupants.

**Potable** = safe to drink

## LIVING BUILDING CHALLENGE

The Living Building Challenge takes green building a step further. This standard of building will be self-sufficient, using only the resources provided on site, and create a net positive impact on humans and the natural environment. Rainwater harvesting is one crucial component of this program and can help bring you one step closer to certification.

For Living Building Challenge certification, one hundred percent of the project's water needs must be supplied by captured precipitation or other natural closed-loop water systems, and/or by recycling used project water, and must be purified as needed without the use of chemicals. All stormwater and water discharge, including grey and black water, must be treated onsite and managed either through reuse, a closed loop system, or infiltration. Excess stormwater can be released onto adjacent sites under certain conditions.

## SITES RATING SYSTEM FOR SUSTAINABLE LAND DESIGN AND DEVELOPMENT

The Sustainable Sites Initiative (SITES) is a program based on the understanding that land is a crucial component of the built environment and can be planned, designed, developed, and maintained to avoid, mitigate, and even reverse these detrimental impacts. Sustainable landscapes create ecologically resilient communities better able to withstand and recover from episodic floods, droughts, wildfires, and other catastrophic events. They benefit the environment, property owners, and local and regional communities and economies. Under Section 3: Site Design - Water, onsite infiltration, evapotranspiration and rainwater harvest reuse is required. Rainwater, rather than potable water, should be used for irrigation and water features. The goal is to incorporate strategies and technologies that restore or mimic natural systems.

## WELL BUILDING STANDARD

The WELL Building Standard is a vehicle for buildings and organizations to deliver more thoughtful and intentional spaces that enhance human health and well-being. WELL includes a set of strategies—backed by the latest scientific research—that aim to advance human health through design interventions and operational protocols and policies and foster a culture of health and wellness. WELL draws expertise from a diverse community of WELL users, practitioners, public health professionals and building scientists around the world. Points can be earned for Onsite Non-Potable Water Reuse or conserve water through non-potable water systems without compromising the health of the building occupants.

# MARKETING YOUR SYSTEM

Once you've invested in a rainwater harvesting system, part of the fun is sharing it with your employees, customers, and community. Showcasing your new system through social media, on-site signage, or other educational efforts helps establish your commercial property as an environmental leader and can even multiply your impact-- the more you show off, the more likely your friends and neighbors are to get involved too!

## Here are some tips for marketing rainwater harvesting systems:

### Make it eye catching.

Rainwater harvesting systems often appear unassuming or inconspicuous, but adding bright signage or fun artwork can improve the overall aesthetic while also drawing attention to your project.

### Advertise the system from start to finish.

Does your new system help provide food for your restaurant? Advertise it on your menus! Do you use rainwater in your toilets? Post signs in the restrooms. By focusing not just on the water collection, but also on the end point of use, you can help people better understand the system and its impacts.

### Share your 'why'.

Your business or organization will benefit from installing a rainwater harvesting system but, ultimately, making this investment is an act of care for your community. Your customers will recognize and appreciate these efforts if you take the time to personalize the message and share the story of why you got involved.

### Connect the environmental dots.

Chances are, rainwater harvesting isn't the only environmental action you take on a daily basis, even if you don't immediately recognize it. By marketing your new system as part of a larger initiative paired with efforts to buy locally, reduce energy consumption, or prevent waste, you can become known as an all-around eco-business.

# START SMALL

There are many rainwater harvesting options that don't require breaking the bank. Using rainwater for small areas of irrigation often does not require any permits and can be a relatively inexpensive investment. Installing any system, no matter how small, will help you save on your water bill over time while also benefiting our local environment. If this is your first time exploring rainwater harvesting, we recommend starting small or contacting your local stormwater professional to decide what scale is right for you. See page 13 for information on how to seek help.

# CODES

## HEALTH AND SAFETY

The water quality of harvested rainwater is especially important to be managed appropriately because of the potential risk of microbial growth. Harvested rainwater will be free of chlorine, a chemical disinfectant typically found in potable water. The absence of chlorine is beneficial for irrigation purposes, but given the right conditions, it can allow for the growth of the bacteria legionella which has been attributed with major health concerns. Other water quality criteria are important as well; however, legionella is of particular concern because exposure leading to health impacts can come from a variety of pathways, including simple spray irrigation. Because of this potential risk, regulatory agencies need to review project designs and potentially ongoing water quality testing to reduce the risk of public health concerns.

## CITY OF MILWAUKEE

City permits are in place to protect you and others from potentially serious health hazards that may arise as a result of mismanaged water. If you are pursuing a rainwater harvesting project beyond a simple rain barrel, we strongly encourage you to contact the City of Milwaukee Permit and Development Center for further instruction on system-specific requirements before you begin a detailed design of the system. If you are working with a professional engineer, they can help ensure you have met all necessary requirements and treatment standards.

**Permits are required if:**

- There is an underground collection tank
- The system is directly connected to the public water supply
- The system supplies water inside the building
- The water is used for potable applications

**Plan review may be required if:**

- There is over 1,000 square feet of roof area to grade or connect to the storm sewer
- There is rain barrel overflow to grade or storm sewer conveyance

## WISCONSIN

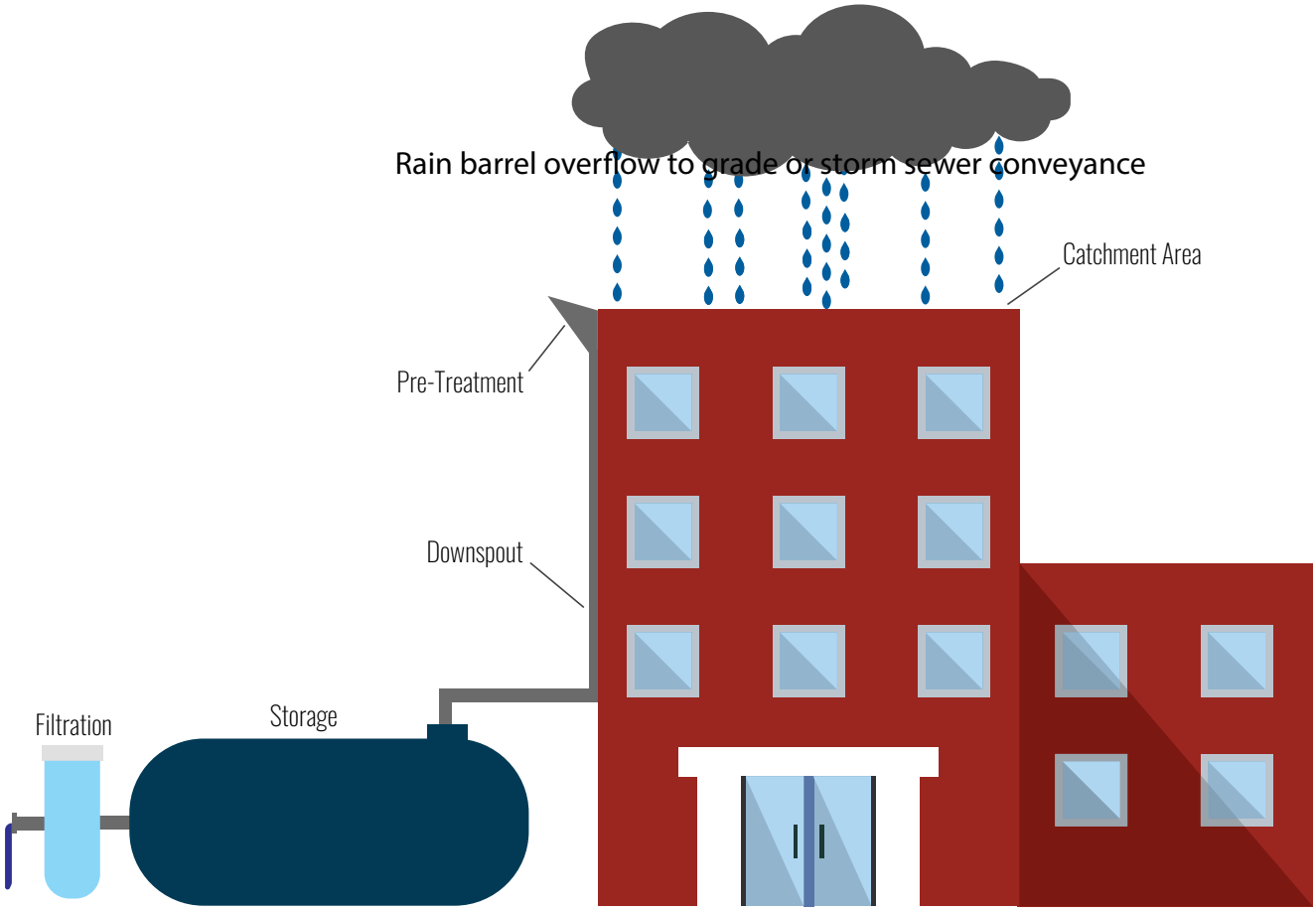
In the State of Wisconsin, the Department of Safety and Professional Services requires any water connected to plumbing to follow the plumbing treatment standards found on Table 382.70-1 of the state plumbing code or Table 1 in this document. A plan exam is required per plumbing code Table 382.20-1 on treatment systems serving commercial buildings designed to treat water for compliance with Table 382.70-1.

**Learn more about State permitting at DSPS.Wisconsin.gov**

**For additional questions regarding City permitting, please contact the Permit and Development Center at (414) 286-8210**

# CATCHMENT

When planning a rainwater harvesting system it is important to first identify the catchment area, or the area where your water will be collected. The roof of your building is ideally where the water will be coming from. Knowing the material, condition, and possible sources of contamination from the catchment area is critical to setting up a healthy rainwater harvesting system. The highest quality water comes from smooth, impervious surfaces so that water isn't absorbed into the material. Because rainwater is slightly acidic it may dissolve materials from the catchment area and transport them into the storage container. The material and condition of the gutter and location of downspouts is equally important to consider when designing your system




# STORAGE

Once you collect the water from the catchment area, you need somewhere to store it until you're ready to use it. But the size of these storage containers may vary from project to project depending on several environmental and economic factors. You should consider how much water you want to use, your space availability, size of the catchment area, and your budget when making the decisions about the scale of your system. Read more about different types of storage containers on the next page.

# TYPES OF STORAGE

## RAIN BARRELS

Rain barrels are large drums, typically about 55-gallons in size. These containers are most commonly used for residential rainwater harvesting but can also be practical for irrigation in small gardens near your commercial building. Rain barrels are a great way to start small and save money while still making an impact. In Milwaukee, rain barrels have become an increasingly popular way to manage stormwater runoff. The Milwaukee Metropolitan Sewerage District (MMSD) sells rain barrel kits easy enough for anyone to install and become a steward for the environment!

**Learn more about MMSD's rain barrel sale at:** mmsd.com/what-we-do/green-infrastructure/rain-barrels

## 200+ GALLON STORAGE

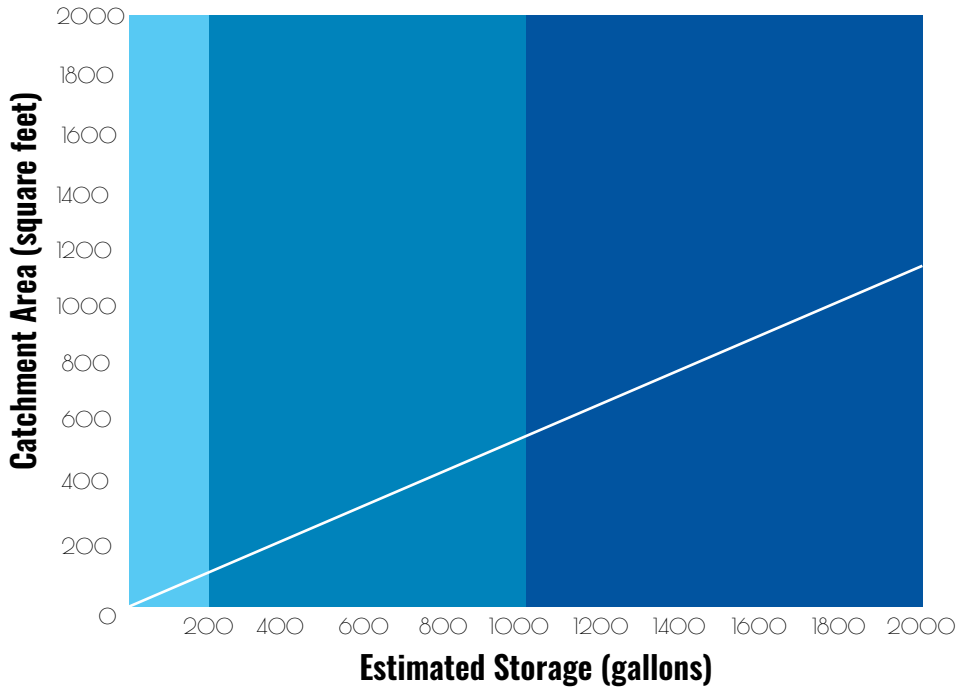
While multiple rain barrels can be connected to increase storage capacity of your rainwater harvesting system, it may be more practical to invest in a large cistern or a water tote. These tanks may vary in materials, filtration system, and overflow capabilities. These systems are practical for larger irrigation systems and for greater storage in times of drought.

## 1000+ GALLON CISTERN

For some projects, a 1000+ gallon cistern may be required to accommodate the water demand. Irrigation for a large area of crops, toilet flushing, potable water, or other large scale applications are all uses that will require a large amount of storage to be beneficial to the building. Cisterns may be above or below ground however, underground cisterns require significant permitting and engineering.

## STORAGE TIPS FROM AN ENGINEER

Cisterns can come in various materials and sizes. Projects requiring large scale cisterns (5,000+ gallons) may want to consider underground storage due to costs, aesthetics, and availability of land. With underground storage, additional excavation costs will be incurred. Because of the additional costs, an economy of scale may be realized with much larger underground systems, 20,000+ gallons, where the incremental cost of each additional gallon captured is less expensive. These larger systems will have higher costs; however, the cost per gallon may be more attractive at the larger scale.




This graph can be used to estimate how much storage you may need based on the size of your catchment area and the average annual rainfall in Milwaukee. This value is just an estimate and may vary based on intended use and other factors.

- Rain barrel
- 200+ gallon storage
- 1000+ gallon cistern

# TREATMENT

## PRE-TREATMENT

All water management systems require some level of pre-treatment. These filters are placed prior to water entering the storage container to prevent debris and coarse solids like leaves from clogging the system, as pictured in the diagram on page 5. Depending on the quality of water and delivery methods, pre-treatment may be all that is required for irrigation and other non-potable applications.

### METHODS FOR PRE-TREATMENT

- Screening
- Downspout filters
- Downspout diverters
- First flush filters
- Floating filters

## FILTRATION

Filtration typically happens after water enters the storage container, but the necessary level of filtration will vary depending on the water's end use. This stage of treatment removes smaller particles that aren't stopped by the pre-treatment stage and can be used to eliminate fine sediment and aesthetic problems like color and odor. Choosing a filter will depend on what contaminants are typically found in your rainwater.

### METHODS FOR FILTRATION

- Activated carbon filters
- Sand filters
- Reverse osmosis filters
- Ceramic filters

## DISINFECTION

Disinfection kills and removes bacteria, viruses, and other pathogenic microorganisms. This process is required for any applications deemed potable including flushing toilets.

### METHODS FOR DISINFECTION

- Chlorination
- UV disinfection
- Ozone

## pH ADJUSTMENT

Depending on the intended use of the water, the pH may have to be adjusted. If the end use requires a neutral pH or if there's a concern the water may corrode metal pipes and lead to contamination, pH Adjustment might be a required final step in the treatment process.

### METHODS FOR pH ADJUSTMENT

- Chemical additive

**pH** = A measurement of how acidic a solution is

# IRRIGATION

The most common use of harvested rainwater is watering plants. Whether you're running a larger-scale urban farm or if you just want to water the landscaping around your commercial property, rainwater harvesting for irrigation is a relatively easy and lower-cost place to start.

## FILTRATION AND DELIVERY

In addition to the storage unit and pipes that are required of all rainwater harvesting projects, irrigation projects often also require a pump to get water from storage to your plants. This system can be primarily underground (subsurface or drip irrigation) or primarily above ground (surface or "spray" irrigation). If the system is connected to plumbing, a filtration system must be implemented to comply with Wisconsin plumbing treatment standards (Table 1). This may include pre-treatment and sediment filters to remove total suspended solids (TSS) and/or lower biochemical oxygen demand (BOD). The State standards for both TSS and BOD depend on your choice between a drip or spray system.

## MAINTENANCE

Maintaining a rainwater harvesting system for irrigation will require cleaning sediment filters. Irrigation equipment should also be regularly inspected for debris, mineral buildup, or physical damage.

**REQUIRED TREATMENTS**

Pre-treatment
Filtration

**PERMITTING**

Not required

**COST**

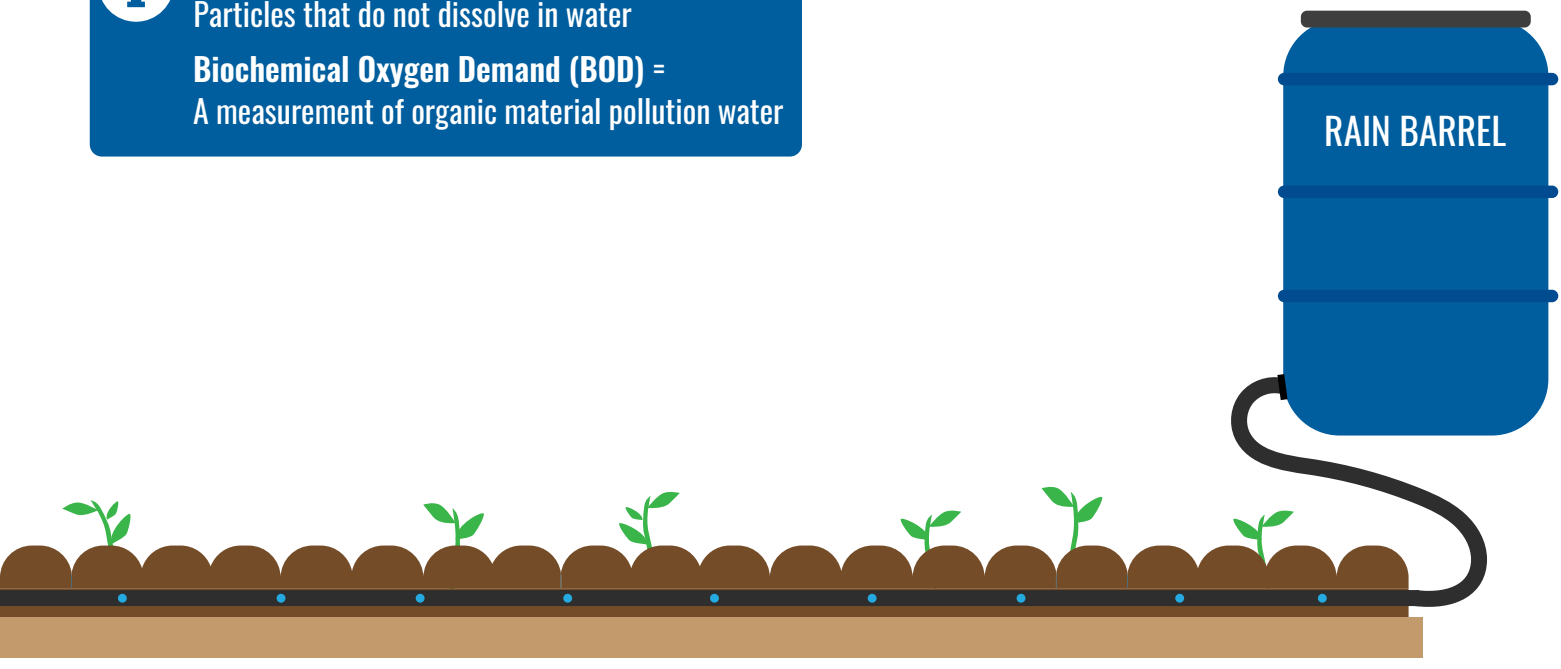
$ - $$

**PROFESSIONAL HELP**

Not required

**Total Suspended Solids (TSS) =**
Particles that do not dissolve in water

**Biochemical Oxygen Demand (BOD) =**
A measurement of organic material pollution water



# IRRIGATION CONTINUED

### DRIP VS. SURFACE IRRIGATION

Drip or subsurface irrigation is a low-impact stormwater management practice which stores rainwater underground and allows it to slowly seep into the soil near a plant's roots. This can be a highly efficient irrigation system and does not interrupt the natural water cycle. Subsurface irrigation also saves water by vastly decreasing surface water evaporation. Surface or spray irrigation is another way to utilize rainwater efficiently to water plants but may require further treatment and equipment, such as sprinklers and pumps. The difference between drip and surface irrigation is primarily in the location and delivery of the water, but there are also differences in State standards for filtration if the system is connected to plumbing. Please consult with Wisconsin plumbing treatment standards in Table 1 of this document for further information.

### Safety Note

Rainwater harvesting for irrigation is a great way to keep your garden happy and healthy, but there are some steps that must be taken to keep the people around your garden safe too. According to Milwaukee Health Code, all food items grown in your garden must be washed with potable (or drinkable) water before resale or use in a commercial kitchen. That means that while your harvested rainwater is perfect for watering your plants, it is not sufficient for washing the produce afterwards.

## CASE STUDY: CREAM CITY FARMS

Rainwater harvesting is an investment in resilience, and perhaps Milwaukee's quintessential story of this is Cream City Farms nestled in the 30th Street Industrial Corridor. This 1.25 acre reclaimed brownfield includes green infrastructure to channel rainwater into a 40,000 gallon underground cistern -- that's about the size of two school buses!

Nearly 100 volunteers including Mayor Tom Barrett came together to install the system that now treats and transports the water via solar-powered pump. The water irrigates the crops, increasing equitable access to fresh, healthy food. Whether or not you're interested in food production on your commercial property, Cream City Farms illustrates that the Milwaukee community supports and celebrates local businesses who take action to protect our watersheds.

Above: Volunteers install AquaBlox to form Cream City Farm's underground cistern.

**Learn more at: CreamCityFarms.com**

# OTHER OUTDOOR APPLICATION

While most people harvest rainwater for plants, there are countless other outdoor applications that could have an even greater impact on your commercial property. Harvested water can be reused for washing vehicles or clothing, air conditioning, soil compaction, washing aggregate, making concrete, cooling towers, and so much more!

### FILTRATION AND DELIVERY

Cleaning rainwater for any of these purposes will require pre-filtration, filtration, and potentially chemical additives if attached to plumbing. An activated carbon filter is recommended to remove TSS and BOD in the water. Depending on the acidity of the harvested water, chemicals (usually sodium hydroxide or hydrochloric acid) will need to be added to the storage tank and monitored regularly to maintain the required pH of 6 to 9. Chlorine residual is also required by the Wisconsin plumbing treatment standards to disinfect the water. Chlorine levels will need to be maintained and monitored regularly. Depending on the intended use of the water, delivery methods may vary by case.

### MAINTENANCE

Filter cartridges will need to be cleaned and changed at adequate intervals. Chlorine and pH levels will have to be tested and maintained at satisfactory concentrations.

### REQUIRED TREATMENTS

Pre-treatment
Filtration
Disinfection
pH adjustment

### PERMITTING

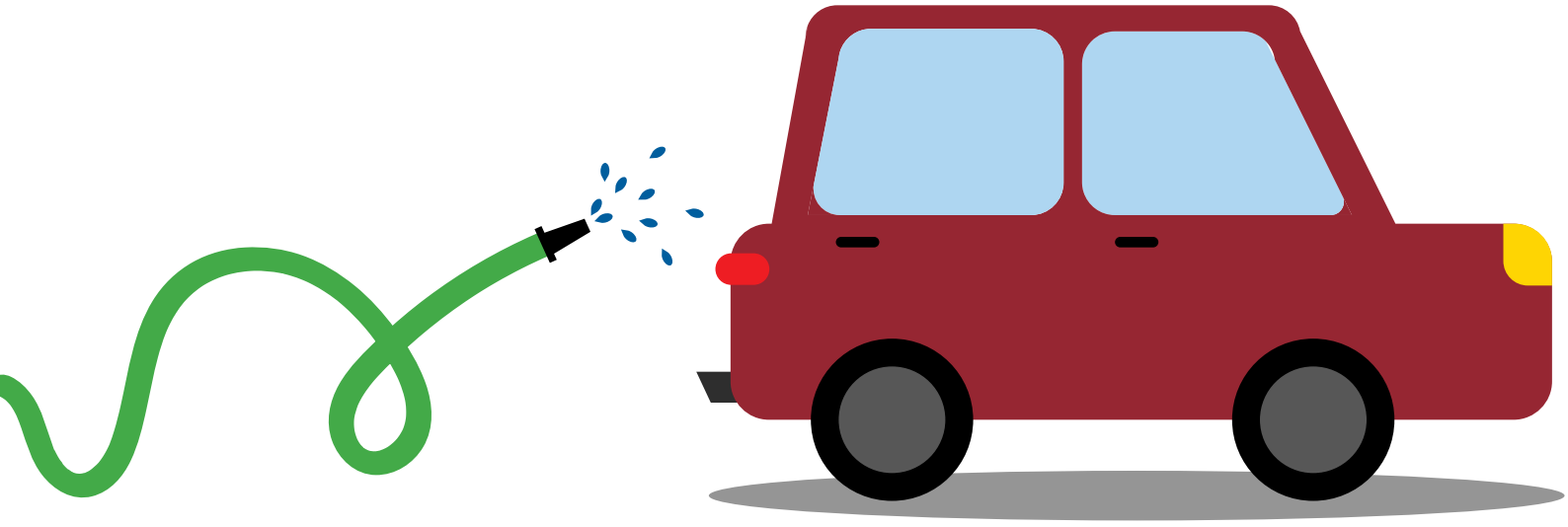
Sometimes required

### COST

$$ - $$$

### PROFESSIONAL HELP

Recommended



# FLUSHING TOILETS

Toilets and urinals are a major use of water in any building. Using rainwater for flushing could have a significant impact on water consumption and cost, but implementing a combined plumbing system will require extensive permitting and more complicated technical measures. Toilet water is required to be potable by Wisconsin DNR standards for the health and safety of the public, as water in toilets can be left standing for days or even weeks depending on the use of the building. Receiving a permit for this will require a professional in the field.

### FILTRATION AND DELIVERY

Using harvested rainwater for toilets will require hiring a plumber to install the system fully so that backup water supplies are available during periods of reduced rainfall. An engineer is highly recommended to design the entire system. All of the previously-mentioned filtration stages (pre-treatment, filtration, disinfection, and pH control) will be required to keep the water at Wisconsin's plumbing treatment standard.

### MAINTENANCE

Filter cartridges will need to be cleaned and changed regularly. Chlorine and pH levels will have to be tested and maintained at satisfactory concentrations. These simple checks can typically be done by a non-professional after the system is installed.

**REQUIRED TREATMENTS**

Pre-treatment
Filtration
Disinfection
pH adjustment

**PERMITTING**

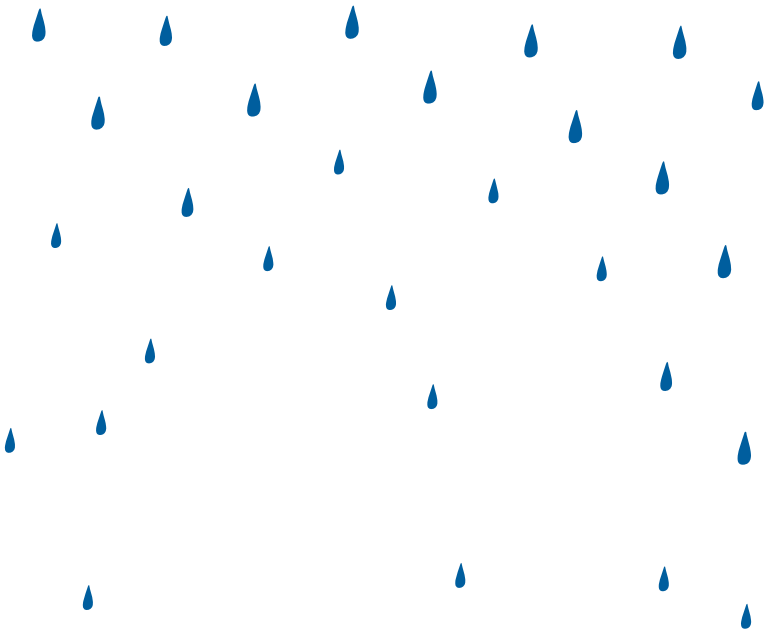
Required

**COST**

$$$$

**PROFESSIONAL HELP**

Required



# CASE STUDY: URBAN ECOLOGY

When Milwaukee's prized Urban Ecology Center (UEC) first began in 2004, they set a goal to create a facility as environmentally conscious as their organization's mission. Part of this courageous plan was to harvest rainwater on site and reuse it to flush the toilets in the facilities, making them the first in the State of Wisconsin to do so.

State health and safety standards require water used in toilets to be potable, which caused both the engineering and permitting of the system to be more complex than in other, smaller rainwater harvesting systems.

As pioneers of the process, the Urban Ecology Center and their engineers from Matrix Mechanical Solutions and Kubala Washatko Architects, Inc. created innovative solutions like the UEC's constantly circulating chlorination system in order to meet State plumbing treatment standards. Water samples were taken after major rain events and tested for contamination to ensure the project was successful.

Photo Credit:
Milwaukee Metropolitan Sewerage District


Photo Credit: Urban Ecology Center

The Urban Ecology Center worked with both the City of Milwaukee and the State of Wisconsin as the project was designed and implemented to ensure proper water treatment standards were met and to help simplify the process for similar projects in the future, such as at Clock Shadow Creamery.

**Learn more at UrbanEcologyCenter.org**

# WHEN TO HIRE AN ENGINEER

While there are many successful cases of “do-it-yourself” rainwater harvesting projects, it is important to acknowledge when professional assistance may be necessary. Bigger projects that require a large cistern, particularly those underground, may need extended planning to design the entire system and ensure there is enough room on site for the necessary infrastructure. Any project that requires connection to the building’s plumbing and supplies water inside the building will likely need professional help from an engineer and/or a plumber. Experienced engineering firms will help you design a safe system and navigate the necessary permitting process.

# WHO TO CALL

The Milwaukee Metropolitan Sewerage District created the Fresh Coast Resource Center (FCRC) to help southeastern Wisconsin improve the health of Lake Michigan through smart use of green infrastructure, like rainwater harvesting. The FCRC assists the community by providing the inspiration, education, and tools needed to create successful green infrastructure projects. The FCRC generated a Green Vendor List to serve as a resource for those interested in green infrastructure and rainwater harvesting projects, products, and services. Check out the vendor list here: www.freshcoastguardians.com/resources/vendors.

The Milwaukee Metropolitan Sewerage District and the City of Milwaukee makes no guarantee as to the professional standard or quality of work. As with any contract work, check references, license and bond status, and professional certifications where applicable.

## CASE STUDY: Clock Shadow Creamery

You can’t get much more ‘Wisconsin’ than Clock Shadow Creamery in Walker’s Point, Wisconsin’s first ever urban cheese factory, but what’s equally admirable is their commitment to sustainable building techniques that earned them a 2013 Mayor’s Design Award.

This ambitious green development conserves 60% of their water through rainwater harvesting, green infrastructure, and greywater reuse. Water that lands on the roof is either retained in the Creamery’s expansive vegetable garden or transported to a 5,000 gallon cistern to later be filtered and used to flush toilets in the building. Wastewater is then also reused in their geothermal system to help heat and cool the structure.

Photo credit: GRAEF USA

**Learn more and book a tour at: ClockShadowCreamery.com**

# Table 1

| Table 382.70-1 | | Treatment Needed | Permit Needed | Professional Recommended |
|---|---|---|---|---|
| **Intended Use** | **Plumbing Treatment Standards** | | | |
| 1. Drinking, cooking, food processing, preparation and cleaning, pharmaceutical processing and medical uses | NR 811 and 812 approved sources | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 2. Personal hygiene, bathing and showering | NR 811 and 812 approved sources | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 3. Automatic fire protection systems | As acceptable by local authority | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 4. Swimming pool makeup water | NR 811 and 812 approved sources | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 5. Swimming pool fill water | DHS 172 requirements | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 6. Cooling water | pH 6 – 9<br>< 50 mg/L BOD5<br>< 30 mg/L TSS<br>Free chlorine residual 1.0 – 10.0 mg/L | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |
| 7. Subsurface infiltration and irrigation, using reuse as the source | < 15 mg/L oil and grease<br>< 30 mg/L BOD5<br>< 35 mg/L TSS<br>< 200 fecal coliform cfu/100 mL | Pre-treatment<br>Filtration | YES | YES |
| 8. Subsurface infiltration and irrigation, using stormwater as the source | < 15 mg/L oil and grease<br>< 60 mg/L TSS | Pre-treatment<br>Filtration | YES | YES |
| 9. Surface or spray irrigation using stormwater and clearwater as the source | < 10 mg/L BOD5<br>< 5 mg/L TSS | Pre-treatment<br>Filtration | NO | NO |
| 10. Surface irrigation except food crops, vehicle washing, clothes washing, air conditioning, soil compaction, dust control, washing aggregate and making concrete | pH 6 – 9<br>< 10 mg/L BOD5<br>< 5 mg/L TSS<br>Free chlorine residual 1.0 – 10.0 mg/L | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | NO | NO |
| 11. Toilet and urinal flushing | pH 6 – 9<br>200 mg/L BOD5<br>≤ 5 mg/L TSS<br>Free chlorine residual .1 mg/ L – 4.0 mg/L | Pre-treatment<br>Filtration<br>Disinfection<br>pH Adjustment | YES | YES |

*See also: Department of Safety and Professional Services Table 382.20-1

*Any subsurface irrigation or infiltration requires a State of Wisconsin Department of Safety and Professional Services plumbing plan review

*Drip irrigation systems do not fall under the plumbing code and do not require a plan review or permit

*Drip irrigation systems must be downstream of any storage tank and the specific use must be irrigation

## Table 2

| Maximum Contaminant Level | |
|---|---|
| **Contaminant** | **mg/L** |
| Atrazine, (total chlorinated residue)1 | 0.003 |
| Antimony | 0.006 |
| Asbestos | 7 Million fibers/L (longer than 10 |
| Barium | 2 |
| Beryllium | 0.004 |
| Cadmium | 0.005 |
| Carbofuran | 0.04 |
| Chromium | 0.1 |
| Copper | 1.3 |
| Cyanide(as free Cyanide) | 0.2 |
| 2,4–D | 0.07 |
| Dalapon | 0.2 |
| o–Dichlorobenzene | 0.6 |
| para–Dichlorobenzene | 0.075 |
| 1,1–Dichloroethylene | 0.007 |
| cis–1,2–Dichloroethylene | 0.07 |
| trans–1,2–Dichloroethylene | 0.1 |
| Dichloromethane | 0.005 |
| Di(2–ethylhexyl)adipate | 0.4 |
| Dinoseb | 0.007 |
| Diquat | 0.02 |
| Endothall | 0.1 |
| Endrin | 0.002 |
| Ethylbenzene | 0.7 |
| Fluoride | 4 |
| Glyphosate | 0.7 |
| Hexachlorocyclopentadiene | 0.05 |
| Lindane | 0.0002 |
| Mercury | 0.002 |
| Methoxychlor | 0.04 |
| Monochlorobenzene | 0.1 |
| Nickel | 0.1 |
| Nitrate | 10 (as Nitrogen) |
| Nitrite | 1 (as Nitrogen) |
| Nitrate+Nitrite | 10 (as Nitrogen) |
| Oxamyl | 0.2 |
| Picloram | 0.5 |
| Selenium | 0.05 |
| Simazine | 0.004 |
| Styrene | 0.1 |
| Toluene | 1 |
| 1,2,4–Trichlorobenzene | 0.07 |
| 1,1,1–Trichloroethane | 0.2 |

## Table 3

| Maximum Contaminant Level Goals | |
|---|---|
| **Contaminant** | **mg/L** |
| Acrylamide | 0.00001 |
| Alachlor | 0.0004 |
| Benzene | 0.001 |
| Benzo[a]pyrene | 0.000002 |
| Carbon tetrachloride | 0.0003 |
| Chlordane | 0.00003 |
| Chlorite | 0.8 |
| Dibromochoromethane | 0.06 |
| Dibromochloropropane | 0.00003 |
| Di(2–ethylhexyl)phthalate | 0.003 |
| 1,2–Dichloroethane | 0.0004 |
| 1,2–Dichloropropane | 0.0005 |
| Epichlorohydrin | 0.004 |
| Ethylene Dibromide | 4E-07 |
| Heptachlor | 0.000008 |
| Heptachlor Epoxide | 0.000004 |
| Hexachlorobenzene | 0.00002 |
| Pentachlorophenol | 0.0003 |
| Polychlorinated biphenyls (PCBs) | 0.000005 |
| 2,3,7,8–TCDD (Dioxin) | 2.00E-10 |
| Tetrachloroethylene | 0.0007 |
| Thallium | 0.0005 |
| Toxaphene | 0.00003 |
| 1,1,2–Trichloroethane | 0.003 |
| Trichloroethylene | 0.003 |
| Vinyl chloride | 0.000015 |

# ACKNOWLEDGMENTS

**The City of Milwaukee Environmental Collaboration Office (ECO) would like to acknowledge those who supported and helped create the Introduction to Commercial Rainwater Harvesting Guidebook:**

City of Milwaukee Department of Neighborhood Services
Milwaukee Area Metropolitan Sewerage District
Emma Diamond, BA Civil and Environmental Engineering
Jamie Ferschinger, Sixteenth Street Community Health Center
Justin Hegarty, P.E., LEED AP, Reflo Sustainable Water Solutions
Judy Krause, Urban Ecology Center
Anna Ostermeier, Graphic Design

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ecoCITY of MILWAUKEE

Fund for Lake Michigan
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**For more information on rainwater harvesting in the Milwaukee area please visit:**

**Residential Rainwater Harvesting**
milwaukee.gov/GI

**Rainwater Harvesting for Urban Agriculture**
refloh2o.com/rainwater-harvesting