Case Study: Milwaukee

Green Stormwater Infrastructure in the Right-of-Way

ALLIANCE for the GREAT LAKES

Photo courtesy of City of Milwaukee

QUICK MILWAUKEE STATISTICS

- **Population:** 592K in 2018
- **0.6% population decrease since 2010**
- **Area:** 97 sq. mi.
- **Appx. 1/3 combined and 2/3 separated sewer system**
- **Consent decree:** No
- **NPDES permit:** Yes/WPDES
- **Stormwater fee credit program:** Yes
- **Post-construction stormwater ordinance:** Yes
- **Snow climate:** Yes

MOTIVATIONS FOR ADVANCING GSI

Regulation. The City of Milwaukee and the Milwaukee Metropolitan Sewerage District (MMSD) are motivated by two key regulations under the Clean Water Act:

1. A combined sewer system services about one-third of the City of Milwaukee. The MMSD has a Wisconsin Pollutant Discharge Elimination System (WPDES) permit which requires them to regulate point source pollution from combined sewer overflows released during wet weather events.

2. The Milwaukee River Basin has a U.S. EPA-approved total maximum daily load (TMDL) restriction, which limits the amount of a specific pollutant a water body can receive.

IMPACT OF CLEAN WATER ACT REGULATION

Water quality is regulated in a variety of ways under the Clean Water Act in Wisconsin. Both of the regulations related to managing volume and quality of stormwater runoff rely on green infrastructure as a strategy by which to reach their goals. In the MMSD service area, streets make up 35% of the impervious surface area, making the right-of-way (ROW) an ideal target zone to manage rain where it falls.

Combined Sewer Overflow Reduction. Renewed in 2019, the MMSD holds a WPDES permit with the Wisconsin Department of Natural Resources (WDNR), as authorized by the U.S. EPA, which limits the volume of pollution that MMSD is allowed to discharge from their combined sewer system and requires monitoring and improvements in order to comply with the Clean Water Act. The MMSD voluntarily offered to include green infrastructure goals within their permit, and held the first permit in the country to require green stormwater infrastructure (GSI) within the body of the permit. This has allowed the MMSD to pass green infrastructure goals and requirements on to the municipalities within their service area and provide funding to incentivize the installation of projects.

Restoring Water Quality. The Milwaukee River Basin is under regulation of a TMDL as approved by the U.S. EPA. While limiting the amount of a pollutant a waterbody can receive, a TMDL also initiates the development of critical restoration plans to meet water quality standards under the Clean Water Act. This regulation has motivated the City of Milwaukee and the MMSD to install green infrastructure projects which manage urban stormwater runoff and improve water quality. As of 2020, the City has a permit based on this TMDL which requires installation of best management practices (BMPs) to provide treatment for an additional 275,000 gallons annually over the permit term.

Water Quality Plan. The WPDES permit requires that the permittee develop a plan to control pollution and improve water quality for the Greater Milwaukee Watersheds within the permittee's planning area. The current plan, published in 2007 (amended 2013), is titled A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds. In concert with the renewed 2019 permit, MMSD was charged with developing a new plan, which was submitted to the WDNR for review in early 2020. The Water Quality Improvement Plan for the Greater Milwaukee Watersheds will be the new guiding document to help Milwaukee and the MMSD reach their regulatory goals.

POLICIES & PROGRAMS THAT PROMOTE GSI IN THE ROW

Complete Streets Resolution. The City of Milwaukee passed a resolution to approve a Complete Streets Policy in 2018. Supported by the MMSD, the policy mandates that stormwater management shall be incorporated in the right-of-way, recognizing the host of co-benefits that green infrastructure brings to Complete Streets.

Storm Water Management Regulations. Chapter 120 of the City of Milwaukee Code of Ordinances requires all development and redevelopment projects disturbing one acre of land or more to provide a stormwater management plan and use green infrastructure to manage a detention volume equal to the first half-inch of rainfall of the site's total impervious area when completed. The regulation aims to promote the co-benefits of green infrastructure while managing runoff and building a more resilient city.

Green Solutions is a program funded by the MMSD's capital budget to improve municipal stormwater management. It funds green infrastructure practices and combined sewer separations to help achieve compliance with the TMDL and reach the goals of the WPDES discharge permit. Approved projects must reduce stormwater runoff using green infrastructure strategies such as Green Streets. In 2019, this program distributed $5 million based on equalized assessed value.

The Green Infrastructure Partnership Program is a competitive grant program that is open to public, private, and nonprofit organizations within the MMSD's service area. Funded by the MMSD's operating budget, it reimburses GSI projects on a per-gallon-captured basis, incentivizing partners to manage more water where it falls and keep volume out of the sewer system.

Stormwater Management Charge and Credit Program. The City of Milwaukee collects a stormwater management fee using two different structures: a flat fee for properties with 1-4 units, and a fee based on total area of impervious surface on a property, calculated in Equivalent Residential Units (ERUs) of 1,610 square feet of impervious surface. Non-residential property owners can install GSI on their property and receive a credit based on total gallons of capture up to a maximum of 60% of the fee. The credit program encourages construction of GSI on non-residential property, which leverages public investment in right-of-way GSI projects and ultimately produces more significant results towards achieving the City's goals. The City uses the fee revenue to manage and reduce stormwater runoff, including Green Streets projects.

Photo courtesy of City of Milwaukee

GUIDING PLANS & STRATEGIES FOR GSI

The City of Milwaukee Green Infrastructure Plan was developed by the City of Milwaukee Environmental Collaboration Office (ECO) in partnership with the MMSD and Department of Public Works, among others. Approved in 2019, the plan is a strategic guide for implementation and prioritization of green infrastructure projects citywide. In addition to identifying funding sources and practice types such as Green Streets, it formalizes policy changes and names stakeholders essential to reaching its specified goals.

ReFresh Milwaukee. Milwaukee's 2013-2023 sustainability plan, ReFresh Milwaukee, set a water goal to reduce stormwater runoff and clear water from entering sewer system. Targets for reaching this goal include creating a City green infrastructure policy plan (since achieved) and increasing the volume of stormwater captured through green infrastructure by 10% annually.

The MMSD Regional Green Infrastructure Plan was approved in 2011 and serves as a key strategy for achieving the MMSD's 2035 Vision for zero basement backups, zero overflows, and improved water quality. It is a roadmap to accomplishing the goal of capturing the first half-inch of rainfall – equivalent to 740 million gallons of stormwater storage – on impervious surfaces using green infrastructure. The plan identifies streets as a target investment area for GSI, since approximately 35% of the region's impervious area is made up of public right-of-way.

GOALS & OUTCOMES

City of Milwaukee

- **Goal:** Manage 36 million gallons of stormwater – equivalent to 143 acres of green space – using green infrastructure by 2030 (City Green Infrastructure Plan).
- **Outcome:** The City of Milwaukee has collected more than 1.6 million gallons through 2019 on public projects.

MMSD

- **Goal:** Capture 740 million gallons of stormwater (equivalent of the first half-inch of rainfall on impervious surfaces) across the region using green infrastructure by 2035 (MMSD Regional Green Infrastructure Plan).

ASSOCIATED BENEFITS OF GSI IN THE ROW IN MILWAUKEE

As identified by Milwaukee's Green Infrastructure Plan, MMSD's Regional Green Infrastructure Plan, and program staff.

Ecology

- Increase biodiversity and habitat
- Recharge groundwater
- Improve water quality
- Reduce/sequester carbon dioxide

Public Health

- Improve livability
- Improve health outcomes
- Reduce heat island effect
- Improve air quality
- Provide recreation space

Urban Vitality

- Reduce flood risk
- Increase property values
- Improve aesthetics
- Reduce crime through design
- Provide community amenities
- Cultivate public education
- Increase social cohesion

Economy

- Create jobs/green jobs
- Improve water infrastructure system
  - Capture typical year's rainfall
- Reduce gray infrastructure maintenance costs
- Reduce risk of damage and associated costs from flooding

GUIDELINES FOR DESIGNING GSI

The Green Streets Stormwater Management Plan was prepared by the City of Milwaukee in 2013 and features recommended green street stormwater strategies suitable for reducing volume and improving quality of stormwater on Milwaukee streets. The primary strategies include bioretention, porous pavement, and tree trenches. Each strategy is complemented with guidance on siting, associated benefits, maintenance considerations, and typical performance metrics. The plan institutes a system for evaluating all road and alley resurfacing and reconstruction projects for the implementation of green street stormwater strategies.

COLLABORATION & PARTNERSHIPS

LEAD AGENCY

Stormwater Unit, Environmental Engineering Section, Infrastructure Division, Department of Public Works. Role: leads coordination and implementation of GSI work citywide.

SUPPORTING MUNICIPAL AGENCIES

Paving Division, Transportation Infrastructure Section, Infrastructure Division, Public Works. Role: designs and coordinates City paving projects.

Environmental Collaboration Office. Role: provides partnerships with non-profits, collaborates with outside stakeholders to promote GSI, and partners in developing long-term plans and updates to City ordinances.

EXTERNAL PARTNERS

Milwaukee Metropolitan Sewerage District (MMSD), a regional government agency that provides water reclamation and flood management services to 28 member communities across 411 square miles. Role: partners with member communities to fund GSI projects on municipal property.

Wisconsin Department of Natural Resources (WDNR). Role: oversees the WPDES permit and TMDL regulations.

FUNDING & FINANCING

The City of Milwaukee uses a combination of sources to fund GSI and Green Streets projects:

- Stormwater management fee revenue
- MMSD's Green Solutions Program

GSI MAINTENANCE RESPONSIBILITIES

City: Public Works contracts their maintenance out in two ways: one larger contract for bioswales across most of the city, and smaller areas reserved for contracts with small local companies and nonprofits, in an effort to stimulate a green infrastructure maintenance economy.

MMSD: The MMSD requires all member communities to have a 10-year maintenance plan for any GSI project they implement.

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PROJECT HIGHLIGHT

Highland Avenue Bioswales on West Highland Avenue from North 12th Street to North 27th Street. Constructed 14 bioswales as part of a paving project, mostly in the medians, plus a few in the tree border.

- **Practice type:** Bioswales
- **Per event stormwater capture:** 105,997 gallons
- **GI project cost:** $400k
- **Funded by:** State funded paving project; City funded green infrastructure

LESSONS LEARNED & KEYS TO SUCCESS

- Involve all relevant stakeholders
- Consider maintenance from the start of a project
- Cluster vegetation in planting layouts so that it's easy to identify a weed from desired plants

SPECIAL THANKS

to the Erb Family Foundation, the City of Milwaukee Department of Public Works, and the Milwaukee Metropolitan Sewerage District for making this case study possible.

ALLIANCE for the GREAT LAKES

PROTECTING WATER, SUSTAINING LIFE

The Alliance for the Great Lakes is a nonpartisan nonprofit working across the region to protect our most precious resource: the fresh, clean, and natural waters of the Great Lakes. Learn more at **greatlakes.org**.