



**PROJECT GROUNDWORK**  
your pipeline to clean water

# Enabled Impact Program

## Sustainable Stormwater Projects

As part of Project Groundwork, the Metropolitan Sewer District of Greater Cincinnati (MSD) is partnering with local organizations to evaluate the effectiveness of sustainable stormwater controls such as rain gardens, green roofs, pervious pavement, and green streets in reducing the volume of stormwater entering combined sewers.

### Background

During rains, our combined sewer system can overflow, making Cincinnati among the top five locations in the U.S. for combined sewer overflows (CSOs).

MSD is under a federal Consent Decree to reduce the overflows and has implemented a major public works initiative called "Project Groundwork" to achieve compliance and bring value to the community through this significant investment.



*Cincinnati Zoo: Phase 1 of the "African Savannah" project included removal of an asphalt parking lot and installation of pervious paving and plantings.*

### Partners in Sustainable Stormwater Control

Since 2009, MSD has partnered with various public and private entities across Hamilton County to demonstrate the use and effectiveness of various sustainable stormwater controls.

This effort, known as the Enabled Impact Program, enables improvements on public and private property to remove stormwater from the combined sewer system, thus reducing overflows.

The stormwater controls are primarily Low Impact Development (LID) projects, which capture less than 10 million gallons of stormwater annually, but the program also includes several larger projects that are anticipated to capture more than 10 million gallons of stormwater a year.

Examples of stormwater controls under evaluation include:

- **Rain gardens** — planned depressed, vegetated areas that capture and absorb runoff from nearby impervious surfaces.
- **Green or vegetative roofs** — roofs that incorporate vegetative materials to uptake and filter stormwater before flowing via gravity to a roof drain system.
- **Bioinfiltration areas/cells** — depressions in the land that are designed to capture stormwater runoff from impervious surfaces (such as roofs and parking lots) through vegetation and subsurface storage.
- **Pervious paving and pavers** — materials used as alternatives to concrete or asphalt that allow water to pass to the ground or to subsurface storage below.
- **Rainwater harvesting** — a process that allows rainwater to be collected before reaching the ground and reused.
- **Bioswales** — long, trough-like areas that capture and detain rainwater on vegetated ground and in subsurface storage for as long as possible before re-entering sewage systems.



*Example of pervious pavement*

# Sustainable Stormwater Projects

## 21 Taft IT High School West End

Vegetative roof and bioinfiltration basin.

## 22 Comer and Osborn Alleys Over-the-Rhine

Permeable pavers.

## 23 Washington Park Over-the-Rhine



Dry wells and green roof. Removes -3.8 million gallons a year.

## 1 San Antonio Church South Fairmount



Permeable pavers and bioinfiltration features.

## 2 St. Francis Court Apts. South Fairmount

Two bioinfiltration basins. Removes -360,000 gallons a year.

## 3 Immanuel United Church South Fairmount

Bioswale and downspout disconnection.

## 4 Roberts Academy Stormwater Control East Price Hill

Retrofit of existing detention basin. Will remove -1.25 million gallons a year. To be constructed in 2014. Funded in part by Ohio EPA Section 319(h) grant.

## 20 Cincinnati Museum Center Queensgate



Vegetative roof.

## 19 Civic Garden Center's Green Learning Station Corryville



Permeable pavers, porous asphalt and concrete, green roofs, bioswales, and cistern.

## 18 Cincinnati State Technical and Community College Clifton

Bioretention pond; infiltration chamber; level spreader; permeable parking lots; 10 rain gardens; and two cisterns. Removes -12.6 million gallons a year.



## 17 Cincinnati Zoo & Botanical Garden Avondale

**African Savannah:** Enhanced turf, porous paving, and storm sewer separation. Removes -15.6 million gallons a year.

**Main Entrance:** Pervious pavers and rainwater storage tank.

## 16 North Avondale Montessori North Avondale

Vegetative roof.

## 15 American Red Cross Norwood

Vegetative roof and bioretention swale.

## 14 Evanston Aquatic Center Evanston

Bioretention basins and porous concrete.

## 13 Clark Montessori High School Hyde Park



Two vegetative roofs, two bioswales, three stormwater planters, pervious pavers, and a rain garden. Removes -1.875 million gallons a year.

## 12 Oakley Square Oakley



Bioinfiltration planters, pervious concrete sidewalks, and a bioinfiltration basin.

## 10 Hartwell Elementary School Hartwell

Porous concrete in parking lot.

## 11 Roselawn Park Roselawn

Three bioinfiltration basins to be constructed by early 2014.

## 6 Carl / Denham Street Project North Fairmount

Pervious concrete sidewalks and amphitheatre pad at CRC park and sprayground.

## 7 North Fairmount Urban Water Project North Fairmount

Bioswale to be constructed in 2014. Funded in part by Ohio EPA SWIF grant.

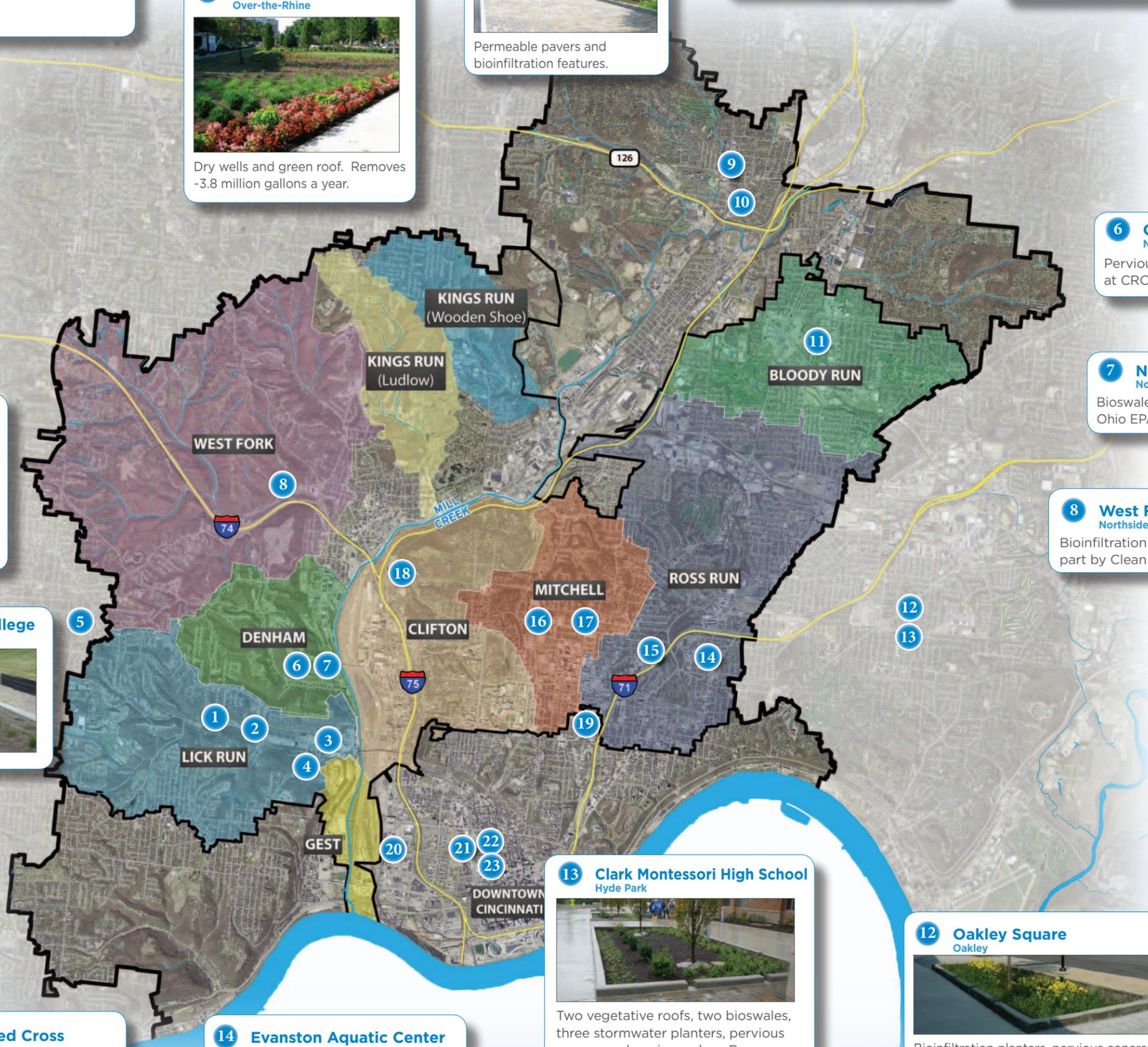
## 8 West Fork Riparian/Floodplain Restoration Northside

Bioinfiltration basin to be constructed in 2014. Funded in part by Clean Ohio grant.

## 9 City of Wyoming Wyoming



Rain garden and 250 rain barrels at residential properties.



# Sustainable Stormwater Projects



*Upper bioinfiltration basin at St. Francis Court Apartments.*

## Stormwater Projects in the Program

The projects, which are located throughout the MSD service area, range from permeable pavers and bioinfiltration features at San Antonio Church (LID project) to a large rainwater harvesting system, rain gardens, and pervious pavement at the Cincinnati Zoo (Regional project). Projects were selected based on the following criteria:

- Located in a watershed that experiences CSOs.
- Could result in reduced stormwater runoff from the site.
- Highly visible in the community.
- Offer education and outreach opportunities.

Stormwater controls are evaluated in terms of benefits, cost, performance, design, operation, and maintenance. Monitoring may be performed to measure water quality benefits and reduction in runoff volume to CSOs.



*A 32,000-square-foot shallow vegetative roof at Taft Information Technology High School.*

## Enabled Impact Program Summary

As of 2013, Enabled Impact Program projects have captured nearly 42 million gallons of stormwater. This was accomplished through the following:

- 105,496 square feet of bioinfiltration systems
- 163,873 square feet of green roofs
- 343,824 square feet of pervious/porous pavement
- 156,555 gallons of rainwater harvesting (rain barrels, cisterns)

Ongoing MSD efforts to measure the effectiveness of sustainable stormwater controls have shown that with proper operation and maintenance they can reduce runoff to the combined sewer by 20-85% depending on scale and design.

## MSD Project Partners

- American Red Cross
- Cincinnati Museum Center
- Cincinnati Parks
- Cincinnati Public Schools
- Cincinnati Recreation Commission
- Cincinnati State Technical and Community College
- Cincinnati Zoo and Botanical Garden
- City of Cincinnati Department of Transportation and Engineering
- City of Wyoming
- Civic Garden Center
- Groundwork Cincinnati/Mill Creek
- Immanuel United Christ Church
- Mill Creek Watershed Council of Communities
- North Fairmount Community
- Rain Garden Alliance
- San Antonio Church
- St. Francis Court Apartments
- Westwood Community Urban Redevelopment Corporation
- Wyoming City Schools
- 3CDC

### For more information:

Visit [www.projectgroundwork.org](http://www.projectgroundwork.org) and under Reports, choose Enabled Impact Program: Interim Summary (2011)  
Contact MSD Engineering Customer Service at (513) 557-3594 or [MSD.Communications@cincinnati-oh.gov](mailto:MSD.Communications@cincinnati-oh.gov)