Results for Stormwater Infiltration in a Combined Sewer System

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GI Infiltration Projects

• Public Square
• UCI Marriot Hotel
• Fleet Avenue
Public Square

Opportunities
• 10 Acre Redevelopment in City Center
• Redesign focused on greening the site
• Partnerships
• Infiltrative Soils

Why and How
• Harvesting for Irrigation and Infiltration
• $3 million committed by the District
• Flow removed from Combined Sewer system
• Increase resiliency to combined sewer system
Public Square

- Perimeter Tree Infiltration
- Pervious Pavement
- Underground Harvesting and Infiltration
Public Square

- 96” Raw Water
- 60” Finished Water
- 48” Perforated
- 50,000 Gallons (storage capacity)
- 10,000 Gallons (per day irrigation)
- 1.9 MG Annual Stormwater Capture
UCI Marriot Hotel
Keeping our Great Lake great.

How hotel drainage works to protect Doan Brook and Lake Erie

The Courtyard by Marriott and its parking lot were designed to protect our local waterways by reducing the amount of water entering the sewer system. How does that work? The Northeast Ohio Regional Sewer District explains it this way.

**Pervious Parking Lot**
Bricks with spaces between allow runoff to soak through and into the surrounding soils.

**Treat + Clean**
Combined flow travels to a wastewater treatment plant so it can be cleaned safely.

**Infiltration**
Roof runoff drains to a storage and infiltration chamber which disperses runoff into soil below, reducing runoff entering sewers.

**Combined Sewer**
Collects sewage and stormwater runoff (from rooftops, roads, parking lots).

**Combined Sewer Overflow**
This is an outfall, which carries excess flow from a combined sewer system to area waterways during heavy rains to prevent sewer backups.

Infiltration reduces the amount of stormwater in the combined sewer, thereby reducing overflows and pollution.
UCI Marriot Hotel

**Outlet to combined sewer system**
This connection will allow for the stormwater runoff to be discharged to the sewer system, but only in very heavy storms when the runoff exceeds the capacity of the system.

**Stormwater chambers**
This system captures the rooftop stormwater runoff. It allows the water to drain naturally into the sandy soils under it, instead of discharging stormwater runoff to the combined sewer system.

**Drainage Area ≈ 1 acre**

- Infiltrates 1 MG annually
- Reduces combined sewer overflows by:
  - 0.4 MG/yr (baseline)
  - 0.1 MG/yr (post-CD)
- Increases resiliency in combined sewer system

Complete in 2013
NEORSD Cost: $270,000

Since August 2013, ALL stormwater has infiltrated onsite
UCI Marriot Hotel

- Outlet Structure
- Level Sensor
- Rain Gauges (not shown)
• 3 storm events with water levels in system – none that reach the 6.7 ft. overflow.
• All stormwater has been infiltrated into soils on site.
• 5/31/15 data from nearest rain gage; other data from radar rainfall data
• Maximum Water Levels Each Year
Fleet Avenue
Fleet Avenue

<table>
<thead>
<tr>
<th>Area to GICM</th>
<th>Imp. Area to GICM</th>
<th>% Imp. to GICM</th>
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<tbody>
<tr>
<td>15.2 acres</td>
<td>10.0 acres</td>
<td>66%</td>
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Fleet Avenue

- Annual SW Capture: 4.8 MG
- Reduces combined sewer overflows by:
  - 3.6 MG/yr (baseline)
  - 0.5 MG/yr (post-CD)
- Increases resiliency in combined sewer system

Complete in Fall 2016
NEORSD Cost ~$2,000,000

Since Fall 2016, ALL stormwater has infiltrated onsite

VIDEO
• Design Modeling
• 4 largest Typical year Storms
• Assumption of Infiltration Rate
  • ~2.2 in/hr
• Storm 60 – highest intensity
• Storm 86 – highest volume

Raised Planter = 686.5
Stone Channel = 684.5
Overflow Elevation = 688.50
48" Perforated Pipe
Fleet Avenue

- GW Well - Level Sensor/Logger
- Perforated Pipe – Level Sensor/Logger
June 30, 2017
- 0.75” in 15 min
- 1.70” in 6 hours

May 19, 2018
- 1.14” in 30 min
- 1.58” in 6 hours
- Differences in design and monitoring data
  - Location of GW Well Sensor
  - Location of Perf Pipe Sensor
  - Infiltration rates (~6.9”/HR to 2.4”/HR)
  - Water Levels in Basin (VIDEO)