

Regulatory and Practical Applications of Green Infrastructure

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Overview of Presentation

- Impacts of Development on Stormwater
- Combined Sewer Overflows
- What is Green Infrastructure
- Regulatory Drivers for Green Infrastructure
 - Stormwater Management Rules
 - CSO Permits
 - Stormwater Permits/MS4
 - NJDEP TMDLs – Nonpoint Source Reductions
- Incorporating Green Infrastructure
- Design Examples/BMPs

“Flooding is New Jersey's #1 Natural Hazard” (FEMA, August 4, 2004)



Manville, NJ – Hurricane Irene, 2011



Bound Brook, NJ – Hurricane Floyd, 1999



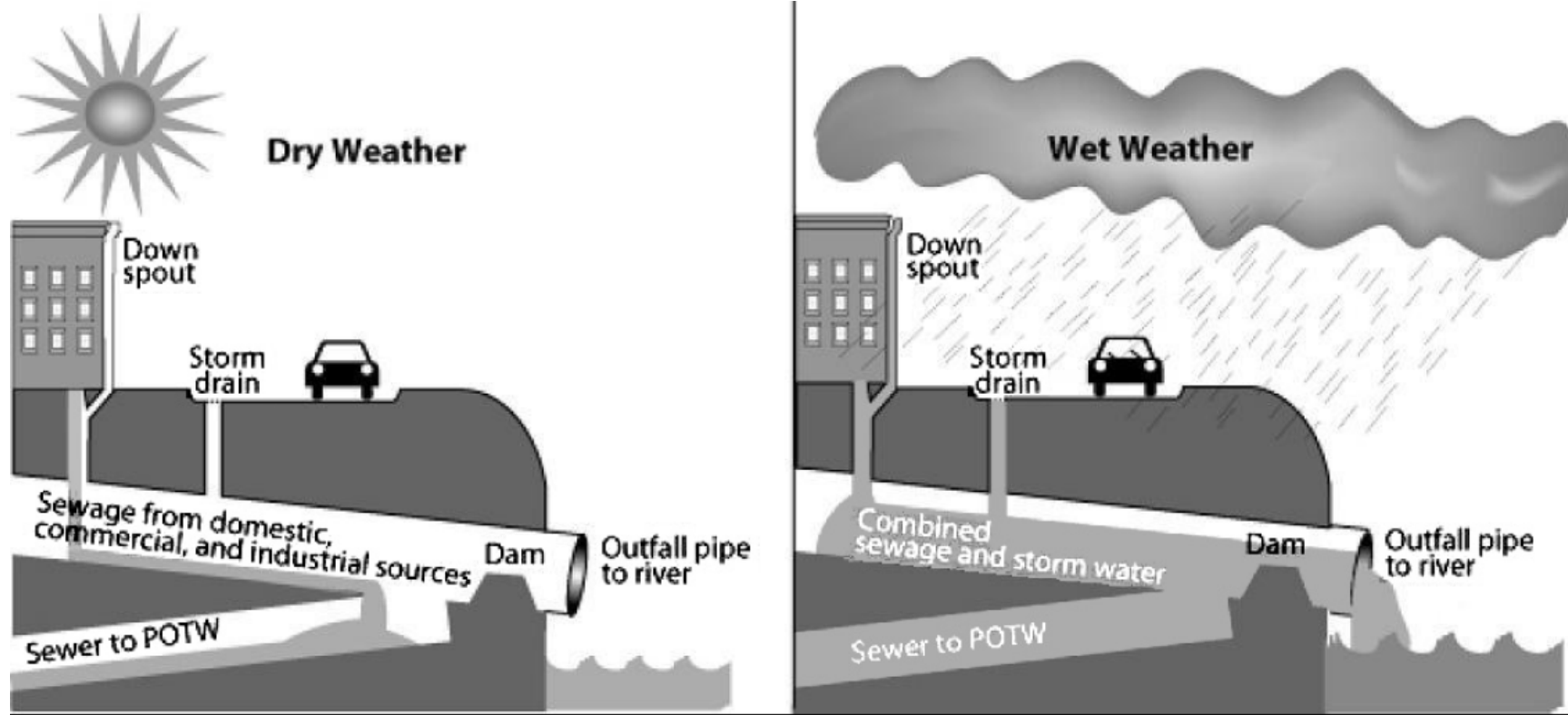
Stockton, NJ – Delaware 2004-2006 Floods

Water Quality Impairments

- Pathogens
- Toxics
- Metals
- Nutrients
- DO/pH
- Suspended Solids
- Temperature



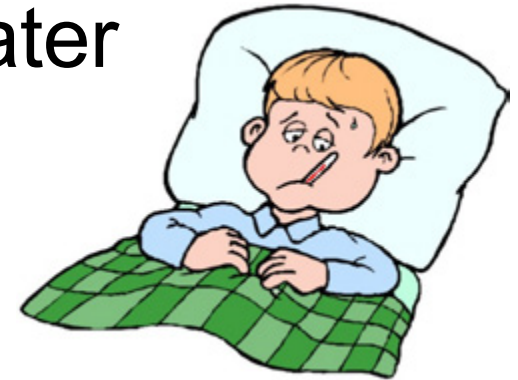
Combined Sewer Overflows



** Acute Human Health Affects from Exposure to Untreated Wastewater

These discharges can cause:

- Exceedance of water quality criteria
- Risks to human health
- Threat to aquatic life
- impairment to the use and enjoyment of the State's waterways.
- waterborne infections including hepatitis, gastroenteritis, and infections of skin, wound, ear and respiratory system.



Although waterborne diseases may also be contracted through inhalation of water vapors, eating contaminated fish and shellfish, and swimming.

- The most common symptoms are diarrhea and nausea; however, pathogens can cause more serious illness and even death.

How Many CSOs Does NJ Have?

- Combined sewer systems serve roughly 1,100 communities nationwide.
- Most communities with combined sewer systems are located in the Northeast, Great Lakes regions and the Pacific Northwest.
 - NJ has 210 permitted CSOs within 21 communities:
 - Northeast NJ : 179 outfalls, 7 POTWs
 - Camden Area: 30 outfalls, 1 POTW
 - Trenton: 1 outfall, 1 POTW
 - NY has 937 CSOs
 - PA has 1,569 CSOs within 152 communities

What is Green Infrastructure? (GI)

NJDEP Definition of GI:

Methods of stormwater management that reduce stormwater volume, flow, or characteristics by allowing the stormwater to:

- infiltrate,
- be treated by vegetation or by soils,
- be stored for reuse.

Green infrastructure includes:

- pervious paving
- bioretention basins
- vegetated swales
- cisterns
- green roofs



Why Green Infrastructure in New Jersey?

➤ Improve our Environment and Communities:

- Community Engagement
- Provide Green Communities
- Address Flooding
- Water Quality/CSO Reduction
- Less reliance on potable water (rain harvesting)
- Increased habitat for wildlife
- Increased property values



continued

➤ To Meet Regulatory Requirements:

- Stormwater Management Rules
- NJPDES Non-Point Source Permitting
- Municipal Stormwater Regulation Program (MS4)
- Total Maximum Daily Load (TMDL)
- Combined Sewer Overflow (CSO) Permitting



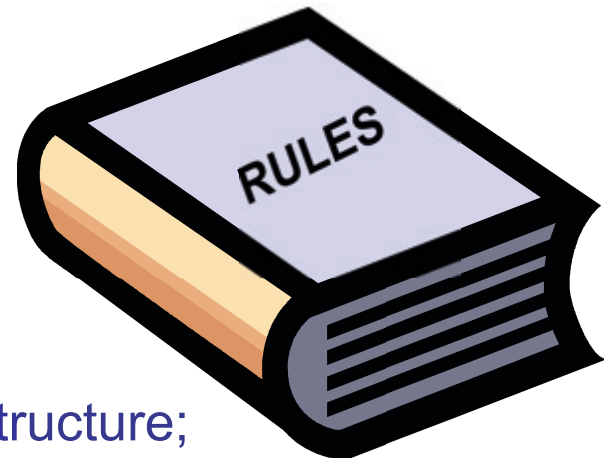
Permitting Requirements in New Jersey

- Stormwater Management Rules (N.J.A.C. 7:8)
 - Establishes stormwater management design and performance standards for new development;
 - Includes: nonstructural strategies, groundwater recharge, runoff quantity and quality controls, and C(1) buffers.
- Stormwater Permitting
 - NJPDES Individual and General Permit requirements
 - MS4 Municipal Stormwater Regulation Program.



Permitting Requirements in New Jersey

- Total Maximum Daily Loads (TMDL) requirements for non-point pollution reduction:
 - Raritan TMDL requires over 80% non-point source reduction
 - Passaic TMDL requires 60% non-point source reduction
- CSO Permit Requirements
 - Evaluate a range of CSO control alternatives, including green infrastructure;
 - Provide for maintenance of GI include adequate staffing and budgeting



How CSOs Drive **Green** Infrastructure Improvements

- NJDEP CSO permits *require* green infrastructure (GI) be evaluated as a control technology alongside grey solutions
- In CSO communities, NJDEP is offering zero interest loans with 100% principal forgiveness for GI projects up to 3 million dollars.
- GI is often community inclusive, and educates the community on overflow issues – can be major component of CSO required “Supplemental Community Teams”



Stormwater Planning Tools and Methods



Nonstructural Strategies/Low-Impact Development

- Preservation of Wooded/Env. Sensitive Areas
- Vegetative Conveyance
- Disconnecting Impervious Surfaces



Green Infrastructure

- Rain Gardens
- Porous Pavement
- Bioretention Swales



Structural Best Management Strategies

- Detention Basins
- Wet Ponds
- Constructed Wetlands

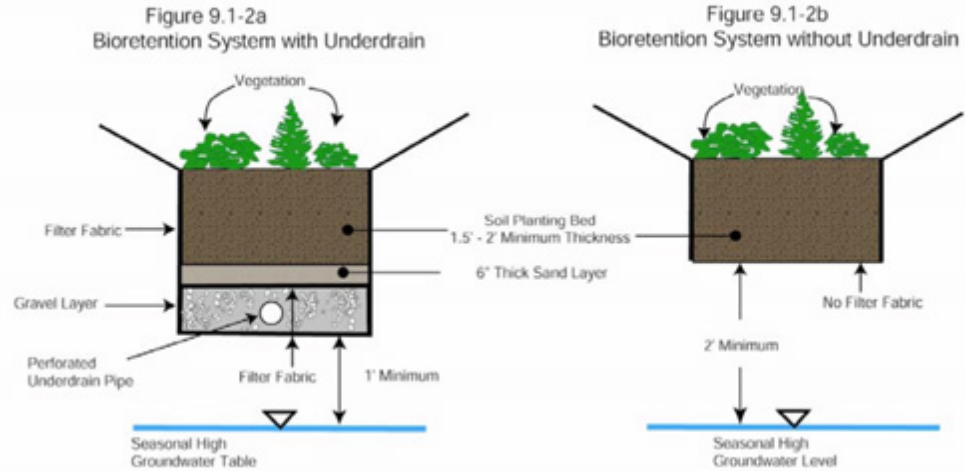
New Jersey Nonstructural Strategies

1. Protect areas that provide water quality or are susceptible to erosion
2. Minimize, break up, and/or disconnect impervious surfaces
3. Maximize protection of natural drainage features and vegetation
4. Minimize decrease in time of concentration
5. Minimize land disturbance, clearing and grading
6. Minimize soil compaction
7. Provide low maintenance vegetation
8. Provide vegetated conveyance systems
9. Provide pollutant source controls

NJDEP no longer uses the Nonstructural Point System Spreadsheet and requires submission of the LID Checklist.

Bioretention/Rain Gardens

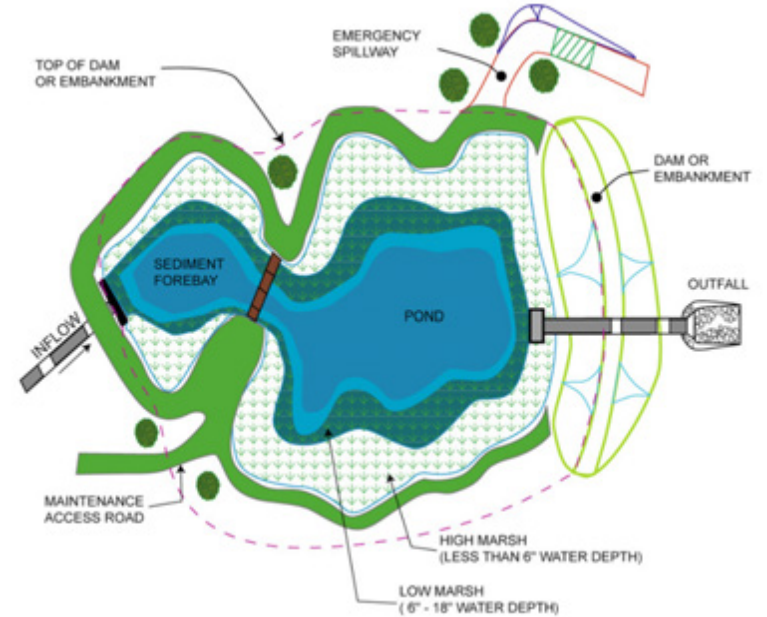
Figure 9.1-2: Bioretention System Details



Reference: NJ Stormwater BMP Manual



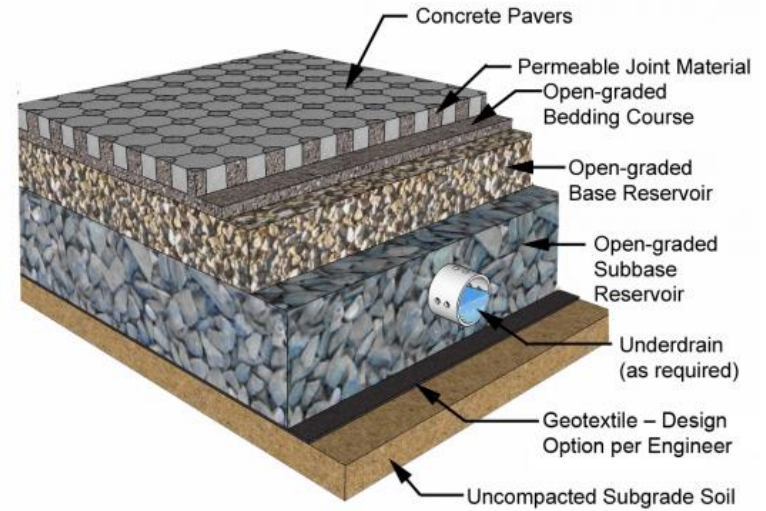
Constructed Wetlands



Reference: NJ Stormwater BMP Manual



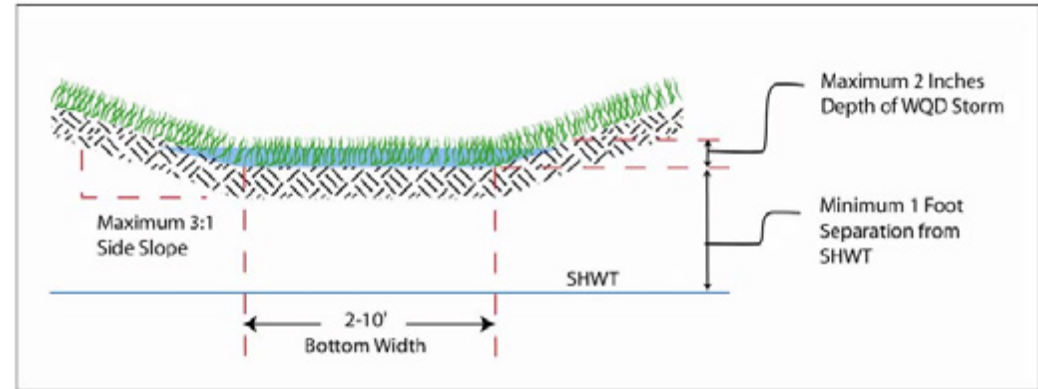
Porous Pavement



Reference: <http://www.icpi.org>



Vegetative Filters and Swales



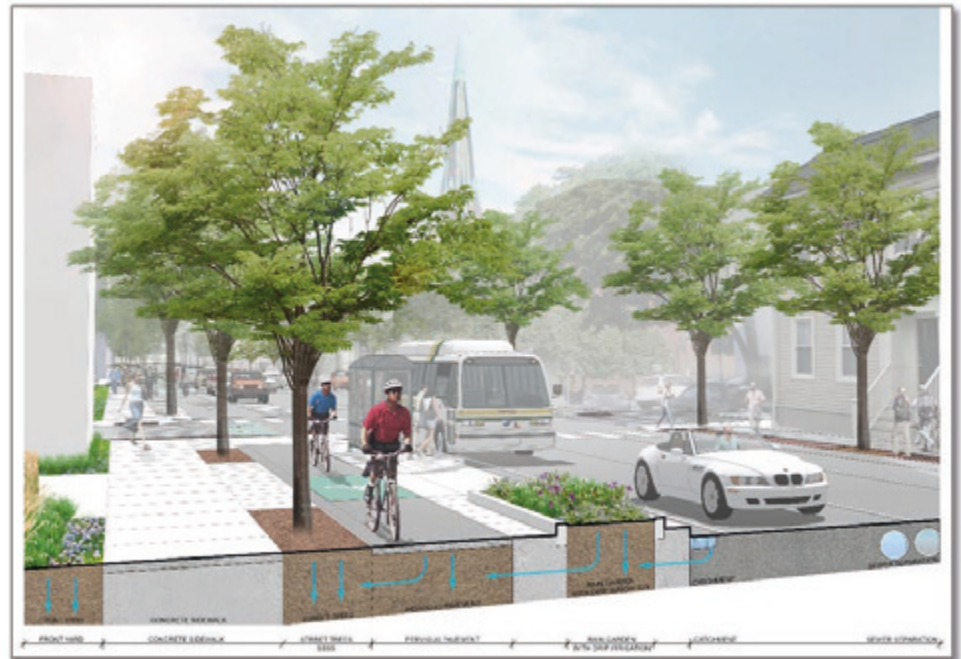
Reference: NJ Stormwater BMP Manual



<http://stormwater.allianceforthebay.org/take-action/structural-bmps/downspout-disconnect/>

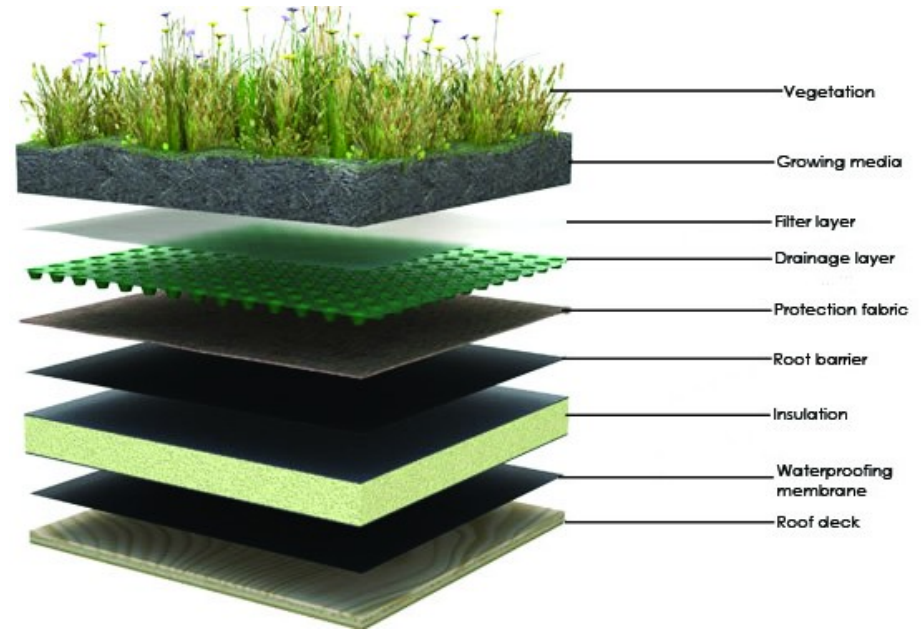


Sustainable Streets

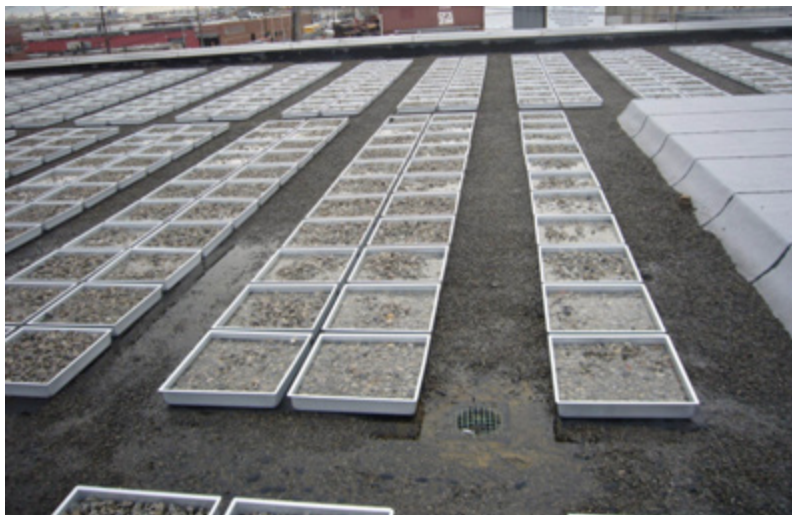


Benefits include stormwater management, aesthetics, green streets (plantings), traffic calming, pedestrian accessibility.

Green/Blue Roofs



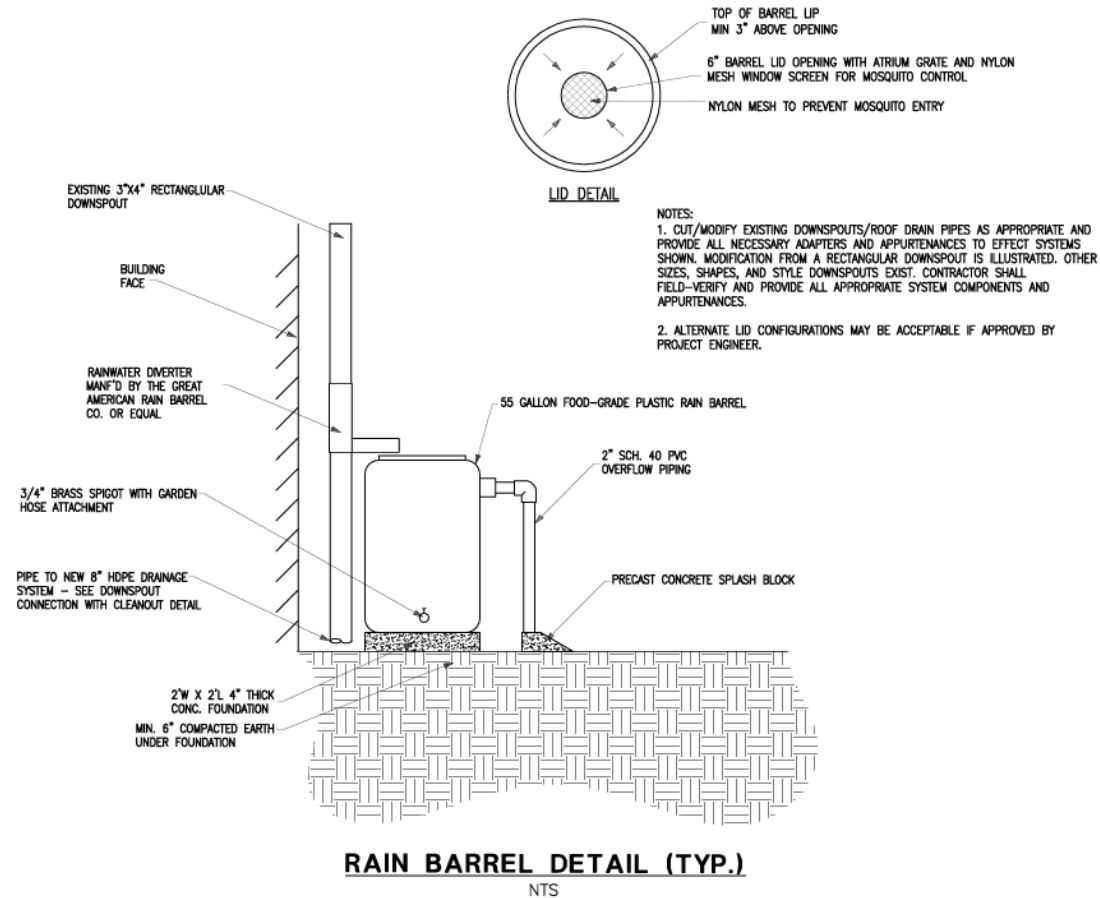
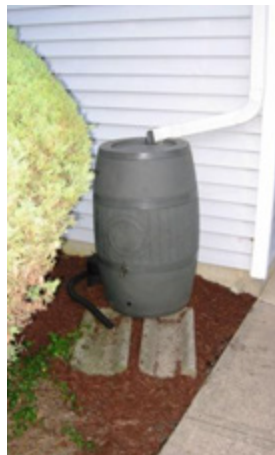
<http://dcgreenworks.org/programs/rainwater-conservation-and-reuse/green-roofs-2-0/>



Rainwater Harvesting

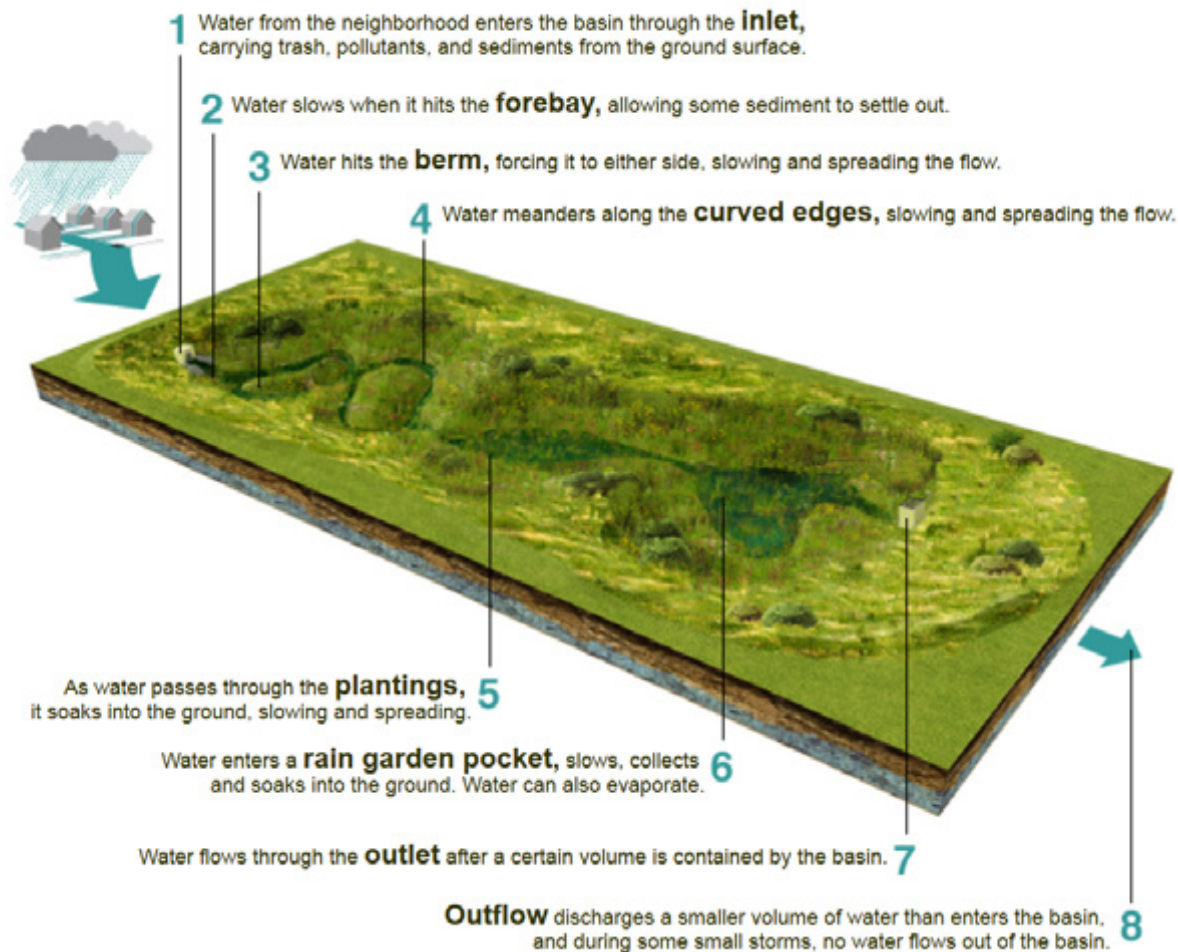


<http://gardenwatersaver.com>

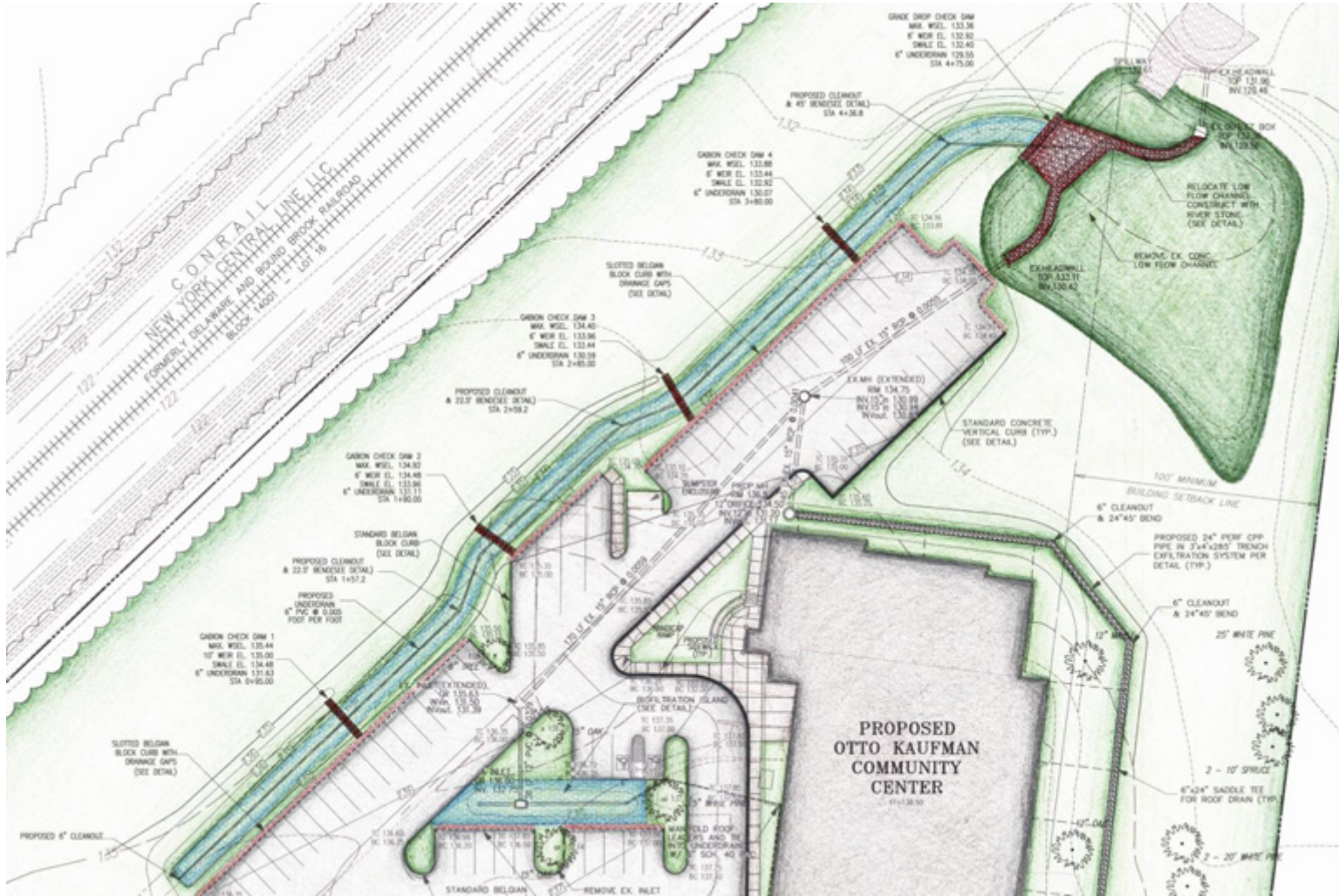


Naturalized Detention Basin Configuration

What Happens to Stormwater in a *Retrofitted* Detention Basin?



Community Center – Montgomery Twp, NJ



Community Center – Montgomery Twp, NJ



Ramanessin Brook Watershed Restoration Monmouth County, NJ



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Cambridge Water Department – Community Gardens and Rails to Trails Project



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Questions



*Photo: Patrick Bingham-Hall
(Singapore)*