Post Construction BMPs

Post Construction BMPs

- Why are Post Construction BMPs important?
  - With increased development brings the increase of impervious cover
    - Parking lots, rooftops, driveways
  - Storm water runoff volume increases with increased impervious cover
  - Runoff from these impervious areas can also pick up harmful chemicals and sediment

Post Construction BMPs

- Why are Post Construction BMPs important?
  - Runoff from impervious areas needs treatment to reduce pollutant levels as well as the volume of runoff
  - Certain infiltration and retention BMPs need to remain after construction improve stormwater management
    - Improving the removal of pollutants
    - Reducing the volume of storm water leaving the site

Post Construction BMPs

- There are many issues with development increasing impervious areas
  - Increased runoff volumes, peak runoff discharges, and runoff velocity
  - The hydrology and geometry of receiving streams and rivers can be effected
  - Water quality can decrease due to the increase of pollutants in runoff

Post Construction BMPs

- Post Construction BMPs are used to:
  - Incorporate stormwater treatment controls to remove pollutants from runoff
  - Maximize permeability on a site
  - Minimize connected impervious areas
  - Incorporate drainage as a design element
  - Protect sensitive areas from encroachment

Low Impact Development

- An approach to stormwater management that maintains some of the site's natural hydrologic function
- Uses stormwater as a resource rather than a waste product
- This focuses on treatment of storm water by on site infiltration
- Infiltration helps remove pollutants and decreases the volume of runoff from a site

Post Construction BMPs

- Post Construction BMP selection
  - An explanation of the technical basis used to select the post construction BMPs needs to be in the SWPPP
  - Numerous factors come into consideration when determining the appropriate BMP

Post Construction BMPs

Selection Criteria

- Site Area
  - Drainage area for the site
  - Drainage from other areas that flow through the site
  - Need to make most effective use of the size of the site
  - Where are the natural drainage ways

Selection Criteria

- Soils
  - Subsurface soils need to be characterized
  - Soils with high absorptive capacity for pollutants are most effective with infiltration
- Hydraulic Head
  - Most BMPs operate under gravity flow conditions
  - Total drop in water level or depth of the water should be evaluated

Selection Criteria

- Slopes
  - Slope, both upstream and within a site, will help determine an appropriate BMP
  - The steeper the slope, the more potential for erosion
  - Velocity dissipation controls may be necessary

Selection Criteria

- Depth to the Groundwater
  - Consideration needs to be given for shallow aquifers
    - Less soil to flow through means less treatment
    - Pollutants can more easily reach groundwater
- Anticipated Pollutants
  - Predicting pollutant type and concentration
  - What BMP will most effectively handle the anticipated pollutants in the runoff

Selection Criteria

- Safety
  - The BMPs must not pose safety hazards to the public
  - It also must not compromise the functions of any nearby infrastructure
- Design Standards
  - MS4s and the DOT may have design standards
  - Be sure to check and follow any standards that need to be followed

Selection Criteria

- Urban Areas
  - These typically have higher percentage of impervious land and a higher potential for pollutants in runoff
  - There is also less space to install a BMP
  - Safety, available space, and aesthetics will be especially important

Selection Criteria

- Wildlife Habitats
  - Critical habitats may require extra levels of protection
  - Vegetative practices can provide a more natural habitat for sensitive wildlife
- Precipitation and Temperature
  - Annual and seasonal data is needed to account for variations
  - Can the BMP be effective in frozen, high rain, and drought conditions?

Selection Criteria

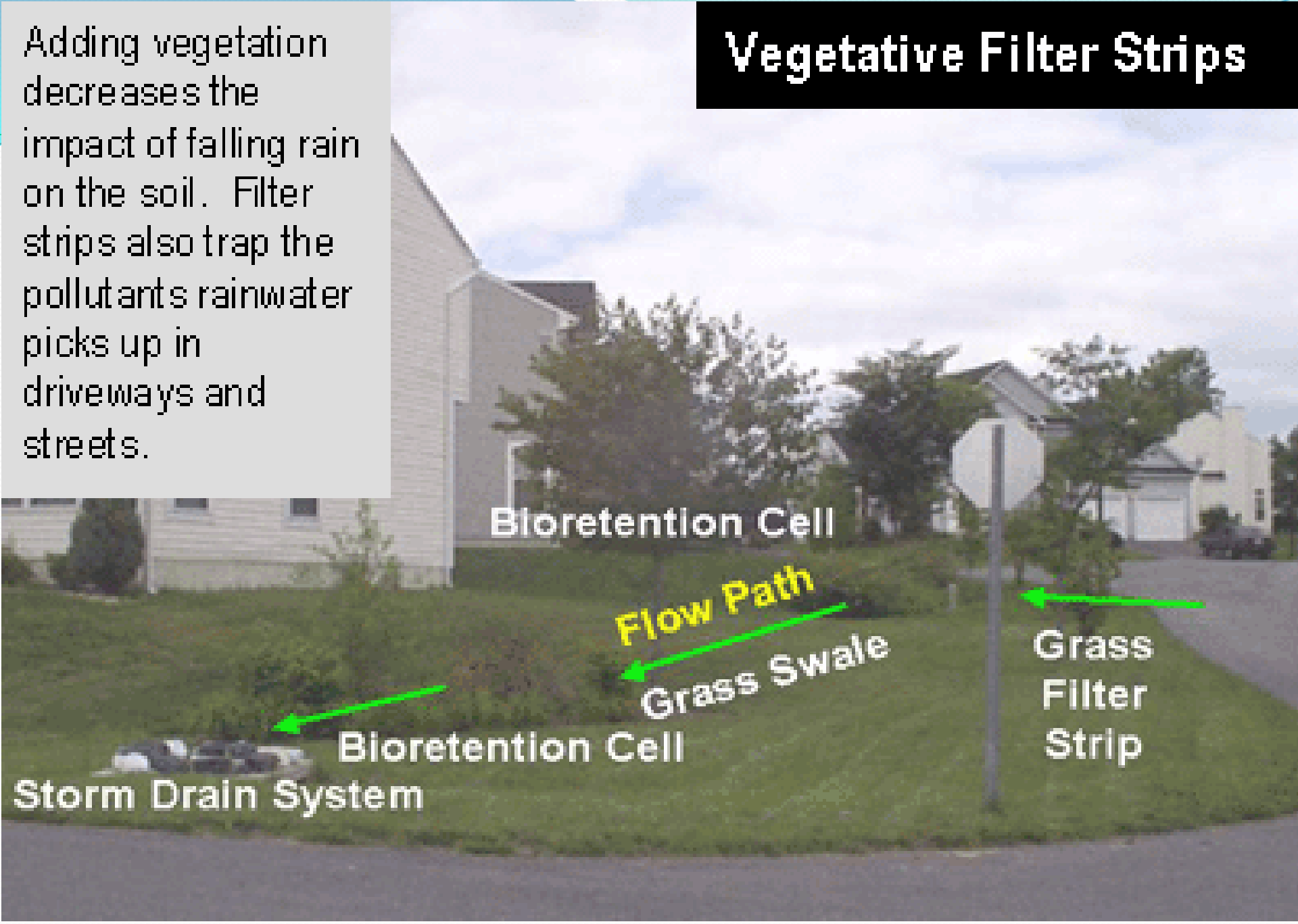
- Cost, Maintenance, and Life Span
  - Cost for planning, designing, constructing, and maintaining the BMP
  - The BMP will need to be inspected and maintained to remain in effective working condition
  - How long can the BMP retain its effectiveness, and when will it eventually need to be replaced

Post Construction BMPs

- Vegetated Filter Strips
  - Most effective treatment for sheet flow
  - Should have a drainage area under 5 acres
  - Remove pollutants by filtration, adsorption, and biodegradation
  - Minimize stream bank erosion
  - Often used to assist other BMPs

Vegetative Filter Strips

Adding vegetation decreases the impact of falling rain on the soil. Filter strips also trap the pollutants rainwater picks up in driveways and streets.



http://www.epa.gov/owow/NPS/nps_edu/urbanx4.html

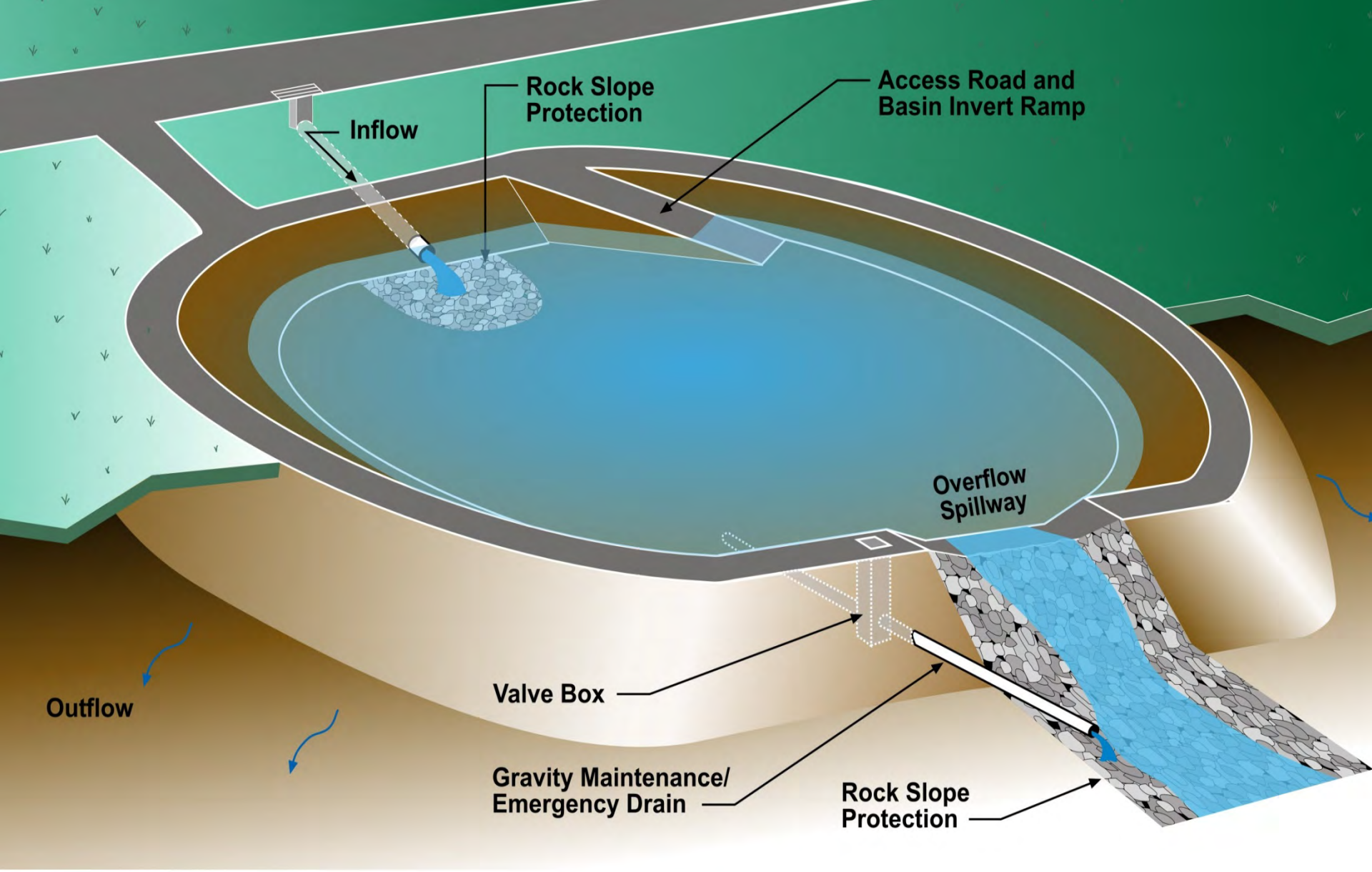
Post Construction BMPs

- Vegetated Swale
  - Vegetated drainage ways with low pitched side slopes
  - Design will force flow to be slow and shallow
  - Often used with berms or check dams to make the swale more effective

http://www.lakesuperiorstreams.org/stormwater/toolkit/swales.html

Post Construction BMPs

- Infiltration Basins
  - Capture stormwater runoff volume and infiltrate it directly into the soil
  - Runoff needs to be directed to a single location
  - Can have a very high removal of pollutants and sediment
  - Not feasible in all situations
    - Contaminated groundwater
    - Shallow groundwater



INFILTRATION BASIN

http://keneulie.wordpress.com/2010/02/06/210/

Post Construction BMPs

- Riprap
  - Erosion resistant ground cover of rocks with a geotextile or granular underlining
  - Great erosion control method at the outlet of culverts, conduits, spillways

http://www.cleanculverts.com/products.html

Post Construction BMPs

- Extended Detention Basin
  - Designed to drain dry over time after runoff ends
  - Recommended detention time when full is 40 hours
  - Provides sedimentation and reduces runoff flow
- Constructed Wetland Basin
  - Requires growth of rushes, cattails, and reeds to slow down and remove pollutants from runoff
  - Can be established in conveyance channels as well

http://water.epa.gov/infrastructure/greeninfrastructure/gi_performance.cfm

Post Construction BMPs

- Filtration Structures
  - Utilizes a filter media to remove pollutants
    - Sand, soil, gravel, peat, compost
  - Are most effective with drainage areas less than 5 acres
  - Have high removal efficiencies for suspended particles
  - Useful in high density urban areas
  - Need to look at potential pollutants to determine what type of filter media to use

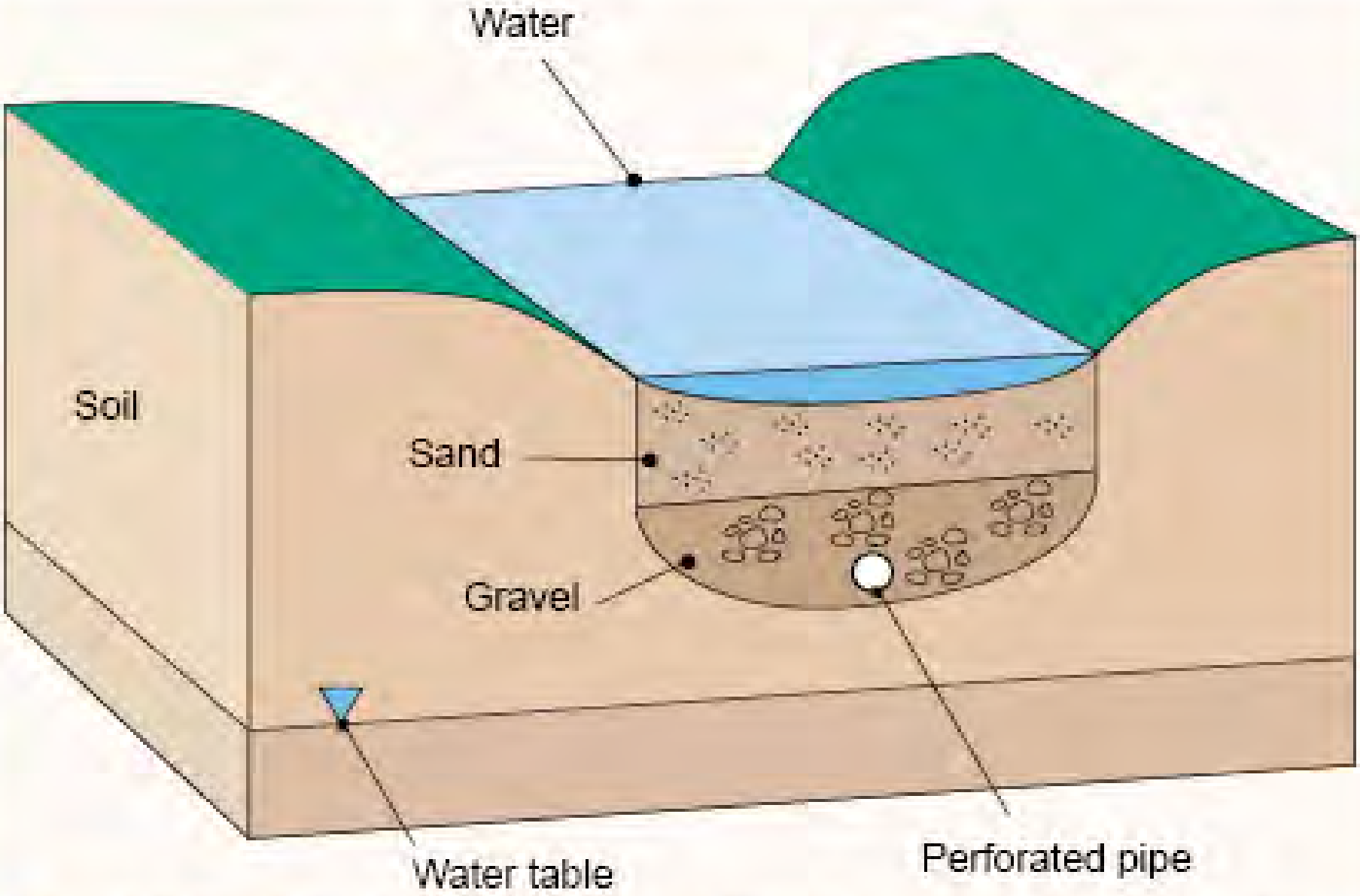


Figure 8.1: Sand filter design cross-section (http://www.pca.state.mn.us/publications/wq-strm8-14ag.pdf)

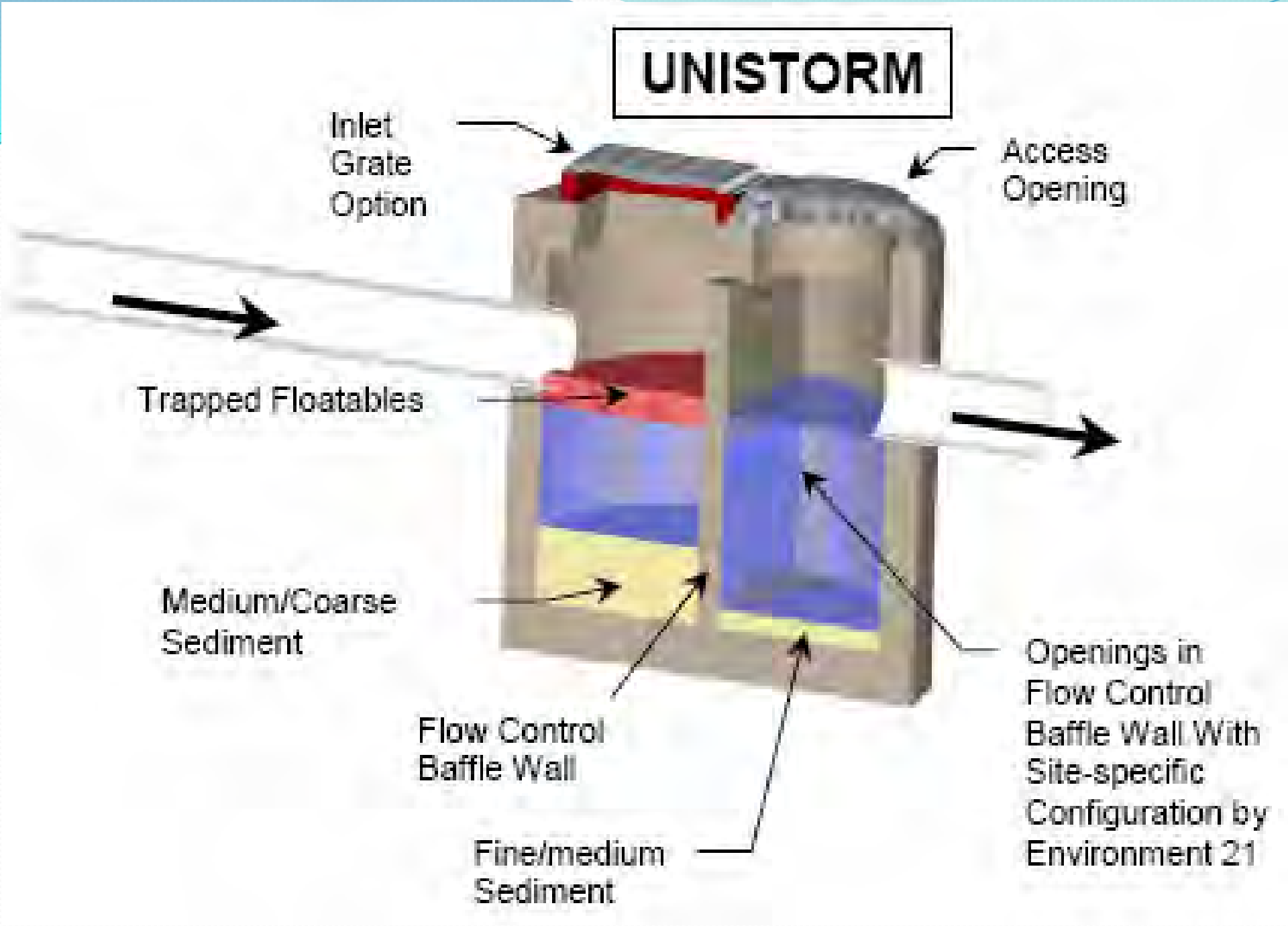
Post Construction BMPs

- Porous Landscape Detention
  - Low lying vegetated area underlain by a sand bed and under drain pipe
  - Small installations (parking lot islands, street medians)
- Sand Filter Extended Detention Basin
  - Has a runoff storage area underlain by a sand bed and under drain system
  - Enhances water quality through filtering and settling

http://vwrrc.vt.edu/swc/NonPBMPSpecsMarch11/VASWMBMPSpec12FILTERINGPRACTICES.html

Post Construction BMPs

- Manufactured Treatment Devices
  - Typically used when space is the limiting factor for stormwater management
  - Can provide a high level of treatment to improve water quality
  - Special installation and maintenance requirements may be applicable
  - May also need to be frequently monitored to determine if maintenance is necessary

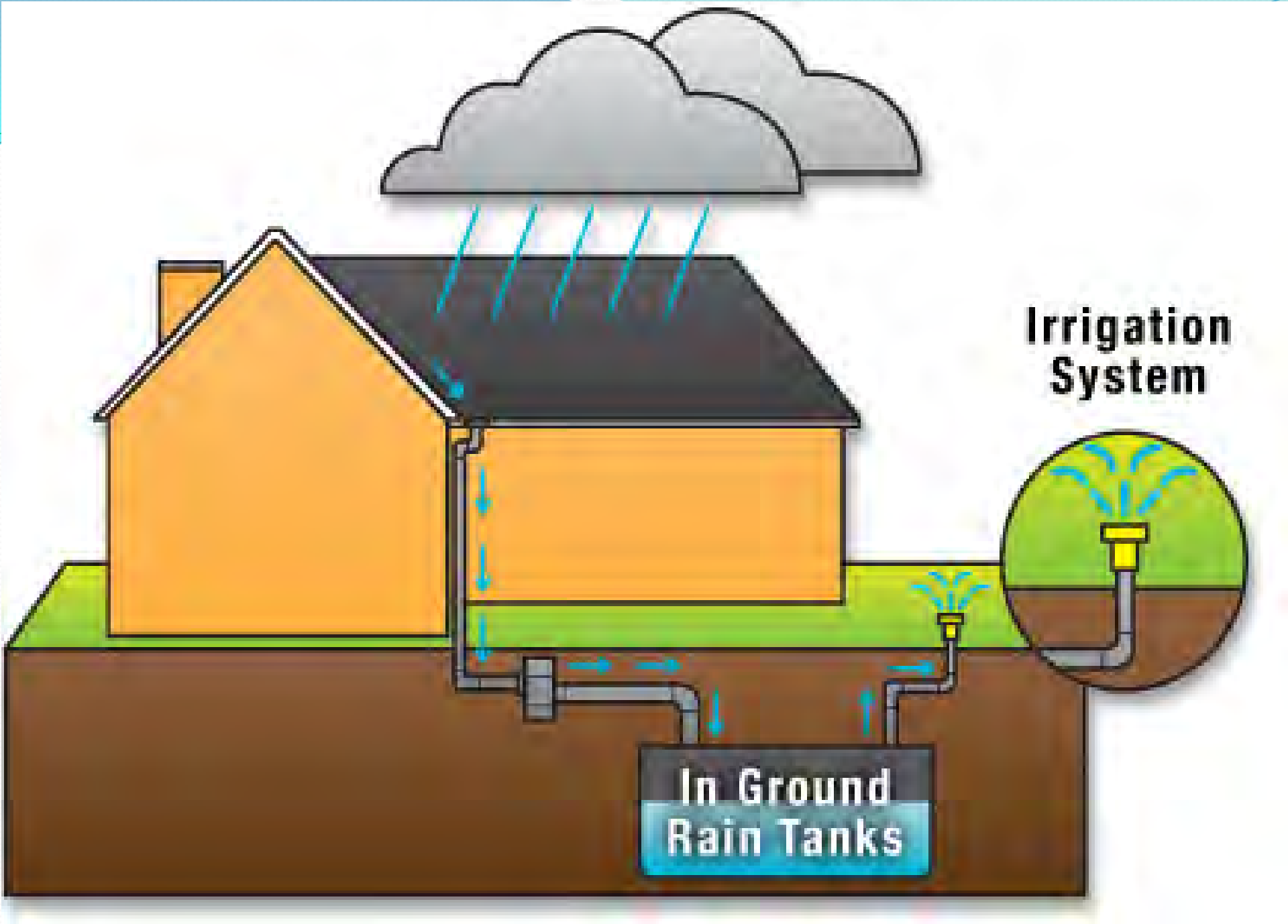


http://www.wateronline.com/doc.mvc/UniStorm-Stormwater-Treatment-System-0001

http://cenvironment.blogspot.com/2011/10/forest-heights-maryland-stormwater.html

Post Construction BMPs

- Rainwater Harvesting
  - Collecting and storing rainwater for watering applications where surface or ground water are normally used
  - Acts as a retention/detention practice
  - Requires collection infrastructure and pumping mechanisms



http://propertycreationsinc.com/rain_water_collection

Post Construction BMPs

- Rain Barrels
  - Hold rainwater from residential rooftops
  - Typically have an overflow option
  - Reduces the volume of stormwater
- Rain Gardens
  - Shallow depression area planted with native vegetation
  - Can discharge to groundwater, a storm drain, or outlet
  - Can add a subgrade tile system to enhance infiltration

http://www.co.stark.oh.us/internet/HOME.DisplayPage?v_page=rpc_storm%20runoff

http://www.butlerswcd.org/Homeowner/RainGarden.html

Post Construction BMPs

- Vegetated Roof Covers
  - Reduce the amount of impervious surface
  - Multilayered
    - Drainage layer under a soil matrix with vegetation
  - Can extend the life of roofs and reduce energy costs

http://www.forestermedia.net/EC/Articles/Stabilitys_the_Name_of_the_Game_15441.aspx