Green Stormwater Management:
A New Way of Controlling Runoff

A bioretention area under construction (left) and completed (right).

The Stormwater General Construction Permit (SPDES GP-0-10-001) now requires the use of the revised NYS Stormwater Management Design Manual (2010), which presents a very different concept of stormwater management than that of the past seven years. As projects enter construction in 2011, a new suite of Stormwater Management Practices (SMPs) will rapidly become more common than the traditional wet ponds with forebays, underground filter systems, pipes, catchbasins, and ditches that we've gotten used to.

In order to become familiar with these new SMPs, it is necessary to understand the logic of why they are being required. The principle behind green infrastructure is threefold:

1) Reduce the amount of stormwater runoff generated by preserving natural features and resources,
2) Reduce the amount of runoff generated by decreasing impervious surface, and
3) Rather than treating one large volume using engineered structures, treat multiple small volumes of runoff near the source using practices designed to mimic natural features.

Designers will be paying a lot more attention to preserving natural features such as trees, vegetation, existing drainage patterns, and resource buffer areas. Margin for error in disturbing or clearing these features will be greatly reduced because these elements are now considered functioning parts of the SWPPP rather than simply part of the landscape.

There are a number of key differences from the "old way" that will affect those doing the construction. Grading will often allow runoff water to be dispersed to vegetated areas rather than directed to a conveyance structure or traditional SMP. Rather than cutting and filling a site to accommodate the project, it will be necessary to work with existing landscape topography and allow the natural conditions to drive the form and layout of the project.

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Although traditional stormwater management practices may still be constructed, they will likely be smaller and fewer in number. The new types of practices will typically be lesser in scale and volume, but will be more numerous and scattered throughout the site. Road widths, parking lot sizes, driveway lengths, and building footprints may decrease. Materials such as porous pavement, specialized soil media, and native vegetation will be commonly used.

Better Site Design practices

Preserving natural features and using them as a means of reducing runoff is one of the key elements of the new design process. The following are examples of how this may be done.

Reducing construction footprints

- Restrict clearing and grading to the minimum required for building and road footprints, construction access, and safety setbacks
- Show limits of disturbance in design and flag the boundaries on the construction site
- Use phased grading rather than mass grading

Preserving key natural hydrologic features

- Maintain vegetated buffers around bodies of water - they remove pollutants and infiltrate runoff
- Maintain existing drainage pathways and drainage areas wherever possible
- Work with topography and avoid flattening hills and valleys

Locating development in less sensitive areas

- Avoid building on steep slopes and erosive soils
- Avoid impacts to floodplains, wetlands, and stream channels
- Take advantage of soils with good infiltration and use them to reduce runoff

Open space design during construction (top) and after (bottom).

Reducing the area of impervious surface

Local codes will likely change to accommodate required elements of the new design process, and variances may become more common. The following may be allowed:

- Narrower streets and sidewalks
- Reduced minimum parking requirements, creation of compact-only spaces, and use of pervious pavement
- Relaxed height restrictions to reduce building footprints
- Open space and cluster design - smaller lots and higher density in part of the development, open vegetated space preserved in more sensitive areas

Green Infrastructure practices:

Green Infrastructure uses natural features such as soil and vegetation, and natural processes such as infiltration, evaporation, and plant uptake, to treat stormwater runoff. Examples include:

Pervious pavement

- Reduces runoff by conveying water through surface to filter into soil below
- Two general types: porous asphalt or concrete, paver blocks
- Usually includes a layer of aggregate and geotextile beneath the surface
- Maintenance includes sediment removal by vacuum sweeping and repair of surface deterioration
- Cannot be used with high groundwater table and must not receive drainage entering from large outside areas
- Underdrain system may be necessary in clay soils with poor drainage

Tree planting

- Trees return water to air through root uptake and evapotranspiration
- Planting is often in “boxes” set below surrounding pavement
- Trees must be watered regularly, and diseased or damaged specimens must be replaced

Rain gardens and bioretention

- Manage runoff using a conditioned soil bed and vegetation in a shallow depression
- Both work through infiltration and plant uptake of water
- Bioretention includes a geotextile layer, specialized soil media, and sometimes an underdrain - with curb cuts or no adjacent curbs
- Rain gardens are generally smaller in scale than bioretention and do not receive parking lot or roadway runoff
- Plant height must be maintained in healthy condition above ponding depth
- Cannot be used on steep slopes

Vegetated swales

- Maintained, shallow turf-lined channel to convey stormwater at a slow rate, allowing infiltration to occur
- Can be used in street right-of-way and on developed sites in place of closed drainage
- Debris and sediment removal and mowing to a height of 4 to 6 inches periodically needed
- Include an underdrain and specialized soil medium in areas with poor drainage

Stormwater planters

- Three types: infiltration (no solid bottom), flow-through (underdrain at bottom) and contained (solid bottom)
- Runoff reduced through plant uptake as well as infiltration (in some designs)

Green roofs

- Layer of vegetation and growing medium, underlain by drainage system and structural reinforcement, atop a safely accessible flat or gently sloped roof
- Captures rainwater and returns it to air using drought-tolerant vegetation
- Cost increases with thickness of soil and density of vegetation
- Maintenance includes irrigation, weeding, plant replacement

GREEN STORMWATER MANAGEMENT:

Some key things you should know during construction

- **Soil must be restored in order for most practices to function**
  - **Aeration, introduction of organic matter, and decompaction are usually needed**
  - **Timing is critical - soil must be restored <u>after</u> grading is complete**
- **Vegetation selection is very important and standards must be carefully followed**
  - **Native species that are suited to conditions must be used**
  - **Maintenance and care are high priorities**
- **Wetlands, buffers, trees, and other natural landscape elements to be preserved must be conspicuously marked onsite**
- **Precise grading of fine-scale features is necessary**
- **If in doubt, check it out! The 2010 NYS Stormwater Management Design Manual is available on NYSDEC's website at:**

<u>http://www.dec.ny.gov/chemical/29072.html</u>

Central New York Regional Planning & Development Board
126 North Salina St., 100 Clinton Square, Suite 200, Syracuse, NY 13202
phone: (315) 422-8276 fax: (315) 422-9051 mail@cnyrpdb.org www.cnyrpdb.org