Bowling Green, Kentucky
Stormwater Best Management Practices (BMPs)
Stormwater Pollution Prevention (Non-Structural)

SPP-02

Activity: Low-Impact Development

LID

LID

PLANNING CONSIDERATIONS:

Design Life:
Permanent

Acreage Needed:
Varies

Estimated Unit Cost:
Varies

Annual Maintenance:
Varies

General Description

Low-impact development integrates a variety of small-scale measures to closely maintain pre-development hydrology and reduce nonpoint source pollution caused by development. It is based on controlling runoff volume and mimicking the original hydrologic regime.

Low-impact Development includes:

- Landscaping and vegetative control practices;
- Infiltration techniques;
- Impervious surface area reduction; and
- Undisturbed Water Body Buffer.

The basis for design is hydrology. Low-impact development applications have shown to be cost effective and cheaper than using traditional stormwater management alternatives. For additional information on low-impact development, visit http://www.epa.gov/nps/lid.

Applications

These practices are applicable to most land uses, and can be very efficient in the following applications:

- In conjunction with structural stormwater BMPs.
- Storage practices that contain runoff until it can be used for other purposes.
- Areas where visual enhancement is desired.

Siting & Design Considerations (cont.)

Landscaping and Vegetative Control Practices

Landscaping and vegetative control practices can be applied to any land use type, but the following site-specific criteria should be considered to properly select a plant species or landscape options:

- Climate
- Topography
- Soil Types
- Wind exposure
- Soil drainage and moisture conditions
- Available light or shade tolerance
- Planned use of the area
- Degree of maintenance desired
- Planting season

Certain criteria may be targeted for landscaping and vegetative control practices for their added stabilization benefits or support of other BMPs. Targeted areas may include:

- Steep slopes
- Drainage channels with natural cover
- Streams and creeks
- Areas connected to catch basins
- Buffer zones
- In conjunction with various structural BMPs (i.e., detention/retention ponds, wetlands, swales, etc.)

Infiltration Techniques

Suitable for nearly all residential, commercial or industrial lots.

- Storage Practices
  - Development density can be clustered to leave areas with soils that have high infiltration rates undisturbed.
  - Where possible, disconnect rooftop downspouts from pervious surfaces to drain over vegetative filter strips.
  - Cisterns and rain barrels have the fewest site constraints.
  - Design and use should have some contingency for overflow or freezing.
  - Best suited for applications with an interest in reusing the water.
  - Pretreatment usually requires a wire mesh filter at the top of the cistern or barrel.
- Infiltration
  - Bioretention and grassed swales are common infiltration techniques.
  - Design and use should consider the peak flow demands, topography, and soil types.
  - In areas where local soils do not readily support infiltration, sand filtration systems can be used to discharge treated stormwater to a stream or storm sewer.
- Rain Gardens
  - Rain gardens are landscaped bioretention facilities that soak up runoff displaced by the impervious area of a structure. Runoff is trapped during a storm event, infiltrating slowly into the soil where it is treated by vegetation and microbes. Rain gardens can increase the aesthetic qualities of a development, and offer a greater benefit than traditional gardens. Rain gardens can have substantial environmental and water quality benefits.

Siting & Design Considerations (Cont.)

- Infiltration requires layers of soil, sand and organic mulch. In areas where local soils do not readily support infiltration, rain gardens can be modified to be underlain with a sand filtration system and underdrain that discharges treated stormwater to a storm sewer.
- Rain garden vegetation should include indigenous plants and can be integrated into current or future landscaping using grasses, ferns or flowering plants.
- Rain gardens should be at least 10 feet away from a structure to prevent groundwater seepage into the foundation. Rain gardens should be built level into a gentle slope that drains runoff. Additionally, rain gardens should not be placed in right-of-way.
- Do not place rain garden directly over septic system.
- Build the rain garden in areas of full or partial sun.

For more information, visit http://www.stormwatercenter.net.

Impervious Surface Area Reduction

Applying techniques to reduce the impervious surface area of new development and redevelopment is often dependent on the applicability, cost, and maintenance of those techniques. Alternative roadway layouts and reduction of parking spaces should be considered to reduce overall imperviousness. Green Parking techniques reduce the impervious area of parking lots and consequently, the amount of stormwater runoff. Likewise, Green Rooftop reduces the impervious area of rooftops and consequently, the amount of stormwater runoff.

Green Parking techniques include:

- Shared parking in mixed use areas and structured parking.
- Building additional parking upwards or downwards (ie., parking garages).
- Design around average parking demands instead of conventional parking requirements. Provide an overflow lot utilizing grass or alternative pavers for peak demand parking. For more information on alternative pavers, visit http://www.stormwatercenter.net.
- Minimizing parking space dimensions by reducing the length and width of spaces.
- Parking areas restricted to compact cars.
- Incorporate bioretention areas in parking lot design to effectively treat stormwater runoff.

Green Rooftop is a layer of vegetation, shrubs, or trees planted on rooftops to absorb stormwater runoff. In the summer, Green Rooftops retain approximately 70 to 100% of the precipitation that falls on them. In the winter, they retain approximately 40 to 50%. A green rooftop generally consist of:

- A waterproofing membrane
- Insulation
- Protection layer
- Drainage layer
- Filter mat
- Soil layer
- Vegetation

Siting & Design Considerations (Cont.)

- The load-bearing capacity of the rooftop should be identified prior to green rooftop design. It is recommended to consult a structural engineer before designing or installing a green rooftop. If the projected live load of a green rooftop is greater than 17 lbs per square foot, consultation with a structural engineer is required
- An internal drainage network that directs flow away from the roof to inhibit ponding should be included in the design.
- Green rooftops can be successfully built on slopes up to 30 degrees.
- Filter pollutants from stormwater runoff or groundwater.
- Recycle carbon dioxide into oxygen.
- Provide shade along waterways and sustain the integrity of stream ecosystems and habitats.
- Forestry is commonly used as an aquatic buffer. The benefits of buffers are increased in a forested condition.

Costs

Low-impact development costs vary depending on the application, area, and land use. A few general guidelines used to estimate costs are listed below.

- Approximately $100 for a rain barrel and up to $200 for a dry well.
- infiltration areas cost about $6.40 per cubic foot of quality treatment.
- Initial costs of a green roof can be 30% greater than a conventional roof. However, long-term maintenance and energy costs savings can offset initial costs and increase the lifespan by as much as 50%. Green rooftops can be warranted up to 15 years.

Maintenance

Landscaping and Vegetative Control Practices

- Irrigation, fertilization, and mulching are variable maintenance practices dependant on the plant species, soil conditions, and topography.
- Established vegetation and landscaping may need periodic seasonal trimming to maintain aesthetic appearance.
- Mow or weed as necessary.

Infiltration Techniques

- Practices require frequent, but small efforts to maintain, such as draining a rain barrel after a large wet weather event, cleaning debris out of the infiltration practices, or keeping the vegetation in the rain garden from overgrowing. Weeding and watering will be needed in the first two years of establishing a rain garden, and thinning of plants in the following years as they mature.
- Maintenance is dependent on the owner's efforts. Can be maintained by commercial landscaping firms.

Maintenance (cont.)

Impervious Surface Reduction

- Alternative pavers generally have a moderate cost of maintenance associated with them and snow removal can be difficult.
- Clear debris or blockage from internal drainage network to prevent overflow and ponding on green roofs.
- Established vegetation on green roofs may need periodic seasonal trimming to maintain aesthetic appearance.

Undisturbed Water Body Buffer

- Established vegetation, shrubs and trees may need periodic seasonal trimming or pruning to maintain aesthetic appearance.