## *Fact Sheet Overview*

The following twenty five (25) fact sheets and four (4) case studies are to be used by stakeholders to assist the Department of Public Works and Environmental Services in selecting approximately six (6) candidate Low Impact Development (LID) practices for incorporation into the Public Facilities Manual (PFM) in the first phase of the LID project. These fact sheets and case studies are overviews of the technology, and the information presented is not to be viewed as peer reviewed data or reports. The purpose of this information is to initiate a dialogue to determine what practices can be immediately used by the design and construction industry and the best way to design, build, and maintain them.

The fact sheets present an overview of the management strategies and technologies. Some of these are already being used in the County, but there is the potential to use them for different water quantity/quality objectives or to modify the design and construction criteria that is currently being used. Other techniques, such as vegetated roofs, are a rapidly emerging technology that can potentially address a wide-range of stormwater management objectives. The information contained in each fact sheet is consistent so that relative comparisons can be made on the critical design, construction, and maintenance issues. Some techniques, such as bioretention, have substantial amounts of information on design, construction, maintenance, costs, and long-term performance. While others, such as soil amendments, may have only limited information available.

Hypothetical applications have been developed to demonstrate the potential use of the several of the technologies for four (4) representative land development and redevelopment scenarios. These scenarios present general information on the design strategies and calculations so that industry can comment on design, analysis, and implementation issues.

Listed below is a brief description and use of fact sheet components.

## *Category:*

The twenty-five (25) practices have been divided into seven (7) functional categories. These functional categories have been developed to organize and catalogue the types of management strategies, design techniques, non-structural practices, and structural practices into the types of systems that are currently being discussed and incorporated by the design industry. Some of the practices may not neatly fit into the category due to their function or design and construction characteristics, but have been placed where they best fit. Table 1.0 includes a categorized list of the 25 practices. Listed below are the functional categories:

> **Category 1.) Bio-Retention Systems:** These systems include a high filtration rate, engineered soil and plants that process and filter pollutants. The systems can be designed as conveyance, detention, or retention systems.

**Category 2.) Filtering Technologies:** Proprietary and non-proprietary media used to trap or treat pollution by flow control.
**Category 3.) Permeable Pavements:** Pavement systems that include a permeable surface and subsurface to infiltrate runoff and is capable of supporting traffic loadings. These systems include a gravel reservoir for storage of runoff through exfiltration or for detention storage.
**Category 4.) Site Design Strategies:** Site design strategies that minimize the hydrologic and hydraulic change on the land through clustering, site fingerprinting, clustering, and flow path disconnection, surface change and lengthening
**Category 5.) Soil Amendments:** Addition of organic and other amendments to soil and mechanical methods that help restore the infiltration capacity of the soil.
**Category 6.) Vegetative Systems:** Planting of vegetation or creating vegetated buffers to filter or absorb rainfall and runoff.
**Category 7.) Water Conservation/Reuse:** The capture and storage of runoff for secondary uses such as irrigation, cooling, and other potable and non-potable uses.

## *Practice:*

There are potentially hundreds of LID management strategies and techniques that can be developed and be applicable for use in the development process. An initial list of twenty five (25) practices is presented that represents a wide-range of approaches that are being used or discussed throughout the country. Most of the practices are quite distinct from the other candidate practices, while others may only have slight variations that are used to address a specific management issue or physical constraint.

## *Water Quantity Calculations*

This section identifies ways that the practice is currently being evaluated and potential options for analyzing the concepts of the practice if it is included in the PFM. Potential methods for analyzing practices that are not currently in the PFM are provided. This includes using methods that are for similar practices currently in the PFM or additional computational procedures.

## *Water Quality Calculations*

A general overview of the pollutant removal mechanisms and efficiencies are presented for each practice. The emphasis is on Phosphorus removal because Fairfax County uses it as a representative measure. The reported efficiency for each practice is from the PFM, and State, and recognized study, as available. In some cases there may be little or no potential or limited available information on the efficiency of the practice so the efficiency from an closely associated practice may be used. Other water quality issues may also be presented in this section.

## *Location*

A description of how and where the practice may be used, based on engineering considerations (such as infiltration rates of soils), and appropriate locations on the site is

presented. This includes sizing and design strategies. Potential combinations of compatible practices are suggested in many cases to illustrate how to develop a strategy that can address multiple water quality and water quantity objectives.

## *Design Construction and Materials*

This section presents the key construction materials, sequence of construction, construction issues, and individual construction item costs. There is obviously a range of costs that can be considered due to economies of scale and individual site constraints.
The costs are average costs that are derived from actual bids, bond costs, or construction industry publications.

## *Cost*

The cost for construction, annual maintenance, substantial maintenance, and total replacement was developed for each practice. The cost is based on using the appropriate number of practices to treat ½ acre of runoff. The cost of the practices was based on a twenty-five year cycle. This was done so that there is a consistent method to compare practices. Many of the practices will have a longer life-cycle or can treat a larger area, but for comparison purposes the ½ acre size and a twenty-five year life cycle were used. The costs are shown in a table for each practice. Detailed costs are shown for the first ten years and then the total cost for replacement is shown for the 25$^{th}$ year. When available, the costs were based on the Bay Program BMP cost data, otherwise data was derived from construction cost estimating publications, bond forms, or best professional judgment.

## *Performance and Inspection*

A description of the inspection requirements, recommended inspection cycle, and inspection issues are presented.

## *LEED Credits*

Many of these practices can be used to obtain Leadership in Energy and Environmental Design (LEED) building and site credits. This is a system that is often used to benchmark sustainability in the design of facilities. A description of how the practice can be used in the rating criteria is presented.

## *Links*

Each practice includes internet links to additional fact sheets, research, or relevant information.

## Table 1.0 BMP Categories

| Category | Category Name | Fact Sheet | Practice |
|---|---|---|---|
| | | | |
| **1** | Bioretention Systems | 1.1 | Bioretention Basins (Peak and Volume) |
| | | 1.2 | Bioretention Cells (Water Quality Only) |
| | | 1.3 | Bioretention Slopes |
| | | 1.4 | Bioretention Swales |
| | | 1.5 | Green Roofs |
| | | 1.6 | Tree Box Filters |
| | | | |
| **2** | Filtering Technologies (non-bioretention) | 2.1 | Catch Basin Controls (Proprietary and Non-Proprietary) |
| | | 2.2 | Dry Wells |
| | | 2.3 | Filtration Devices (Proprietary and Non-Proprietary) |
| | | 2.4 | Gutter Filters |
| | | 2.5 | Street Sweeping |
| | | 2.6 | Surface Sand Filters |
| | | 2.7 | Water Quality Swales |
| | | | |
| **3** | Permeable Pavements | 3.1 | Infiltration Strips (Percolation) |
| | | 3.2 | Permeable/Porous Pavements (Asphalt, Concrete, Blocks) |
| | | | |
| **4** | Site Design Strategies | 4.1 | Disconnect Impervious Areas/Downspout Disconnection |
| | | 4.2 | Flow Splitters |
| | | 4.3 | Site Minimization/Fingerprinting/Impervious Areas Reduction |
| | | 4.4 | Time of Concentration Practices/Surface Roughening |
| | | | |
| **5** | Soil Amendments | 5.1 | Soil Amendments |
| | | | |
| **6** | Vegetative Systems | 6.1 | Bayscapes/Environmentally Sensitive Landscaping |
| | | 6.2 | Planter Boxes |
| | | 6.3 | Reforestation/Afforestation |
| | | | |
| **7** | Water Conservation/Reuse | 7.1 | Cisterns/Rain Barrels |
| | | 7.2 | Pollution Prevention |