



County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods, and diverse communities of Fairfax County

DATE: July 16, 2007

TO: All Architects, Attorneys, Builders, Developers, Engineers, and Permit Services Practicing in Fairfax County

SUBJECT: Low Impact Development Practices - Amendments to the Public Facilities Manual

On March 12, 2007, the Board of Supervisors adopted amendments to the Public Facilities Manual (PFM) incorporating design and construction standards, plan submission requirements, and requirements for the release of bonds and conservation escrows for 6 Low Impact Development (LID) practices. The 6 LID practices are: pervious pavement; bioretention filters and basins (a.k.a. rain gardens); vegetated swales; tree box filters; vegetated roofs (a.k.a. green roofs); and reforestation. The amendments became effective on March 13, 2007. All subdivision construction plans, site plans, and lot grading plans submitted prior to March 13, 2007 are grandfathered. However, it is requested that engineers consider incorporating the new facility design standards on 2nd submissions of grandfathered plans where practicable in order to achieve optimal performance of the facilities (e.g. specifying use of the bioretention soil mixture). The purpose of this letter is to highlight certain elements of the amendments related to facility design, plan review, plan processing, and construction.

Use and Location:

Restrictions on the location of LID facilities are based on considerations for the long term sustainability of these facilities including issues such as maintenance, inspection and enforcement, encumbrance of residential property, and practical application dependent on the type of use. The restrictions only apply to facilities constructed for the purpose of satisfying the detention or water quality control requirements of the Subdivision, Zoning, or Chesapeake Bay Preservation Ordinances. All facilities must be privately maintained except where they are used by the County on County owned property. The restrictions are summarized in the attached table.

Inspection, Certification & Testing:

Past experience has demonstrated that the proper functioning of LID practices is directly related to the care exercised during construction and adherence to the design specifications. To achieve the high standards of workmanship needed in constructing these facilities, third party inspections, various certifications, and testing are required for all of the proposed structural LID practices. It is the owner's responsibility to provide for inspection during construction of the facility by a licensed professional (In accordance with standard practice, the actual inspections may be performed by an individual under responsible charge of the licensed professional). Note that the licensed professional responsible for the inspections does not need



to be the same licensed professional who sealed the design plans. The licensed professional must certify that the facility was constructed in accordance with the approved plans. The licensed professional's certification along with any material delivery tickets and certifications from the material suppliers and results of the inspections required by the PFM are to be submitted to the County prior to bond release as noted below. Additional guidance on certification requirements is being developed and will be included in a forthcoming letter to industry.

For projects that require as-built plans, the required certification and supporting documents are to be submitted with or incorporated in the as-built plans. The certification and supporting documents should be submitted on plan size sheets incorporated in the as-built plans so that they can be more easily microfilmed.

For projects that do not require as-built plans, the required certification and supporting documents are to be submitted for review and approval prior to the request for a RUP or non-RUP. The certification and supporting documents should be submitted as a complete package to the Environmental and Facilities Inspections Division (EFID) inspector. Certification packages will be accepted for review in advance of the formal RUP or non-RUP request. Please allow a minimum of one week to review the certification and supporting documents prior to requesting a RUP or non-RUP inspection.

Construction Considerations:

Except for vegetated roofs and reforestation, all other LID practices may be constructed only after the drainage area to the individual facilities is completely stabilized. This may require separate erosion and sediment controls designed specifically for construction of the LID facilities.

In the initial siting of facilities, sufficient space must be provided around the facilities to accommodate construction techniques and equipment that may vary from more conventional construction practices. Because LID facilities are installed last, access for heavy construction equipment and vehicles, especially excavating equipment, may be restricted both horizontally and vertically by buildings and other structures. The clearance and area that is needed for safe equipment operation to construct these facilities must be considered.

To prevent compaction of the filter media and infiltrating surfaces, heavy construction equipment and vehicles are not allowed on the surface of bioretention facilities to place materials. For bioretention and pervious pavement facilities designed for infiltration, excavation from within the facility should be avoided. Where excavation must be performed from within the facility, equipment should be limited to relatively light tracked vehicles that will cause the least compaction of the basin floor.

Maintenance Agreements:

Attachments to the standard maintenance agreements are being developed for each of the structural LID practices. Please assure that the correct attachment is included with the signed maintenance agreements at the time of submission to Plan and Document Control.

Maintenance Access:

As a subclass of stormwater management and BMP facilities, LID facilities generally must comply with the maintenance design considerations of § 6-1306. However, the specific requirement in § 6-1306.3F for all weather vehicular access roads is only applicable to bioretention facilities not located on individual buildable single family detached lots. Please note that in addition to asphalt, concrete, and gravel, all weather surfaces may be made of geosystems such as Geogrid, Grass-rings, Geoweb, or Grasscrete. These types of pervious all weather surfaces are more compatible with LID philosophy. Specific maintenance access requirements for bioretention facilities, vegetated swales, tree box filters, and vegetated roofs are included in the PFM amendments for these practices.

Requirements for Bonds, Conservation Deposits, and Issuance of RUPs and Non-RUPs:

All LID facilities to be constructed with subdivision or site plans must be bonded. Construction costs except for the installation of plant materials are to be included in the bond estimate. The costs for installation of plant materials are to be included in the conservation deposit. Where LID facilities are proffered, the costs for installation of plant materials must be bonded in addition to being included in the conservation deposit. For non-bonded construction plans, all construction costs should be included in the conservation deposit. Cost estimates for the construction of LID facilities will be included in the new unit price schedule currently under development. The PFM amendments require that conservation deposits be held in accordance with the attached schedule.

Construction of LID facilities must be completed prior to issuance of RUPs and non-RUPS except when planting is precluded by seasonal weather conditions. When seasonal weather conditions preclude planting in accordance with PFM requirements, “winter waivers” for the installation of plant materials may be granted where appropriate. Winter waiver requests must include an acceptable description of how the facility is to be protected from clogging by sediments prior to permanent stabilization and planting. The drainage area to the facility also must be final graded and temporarily stabilized prior to installation of the LID facility.

Plant Schedules:

Plants to be installed in LID facilities should not be incorporated into the plant schedule for general project landscaping. Plantings for LID facilities should be listed on a separate schedule in such a manner that the plants to be installed in individual LID facilities may be easily identified. This will facilitate review of the estimates for the conservation deposit.

Comments on Individual Practices:

- Permeable Pavement

Parking surfaces constructed of porous asphalt pavement and open jointed concrete blocks qualify as dustless surfaces under § 11-102.11 of the Zoning Ordinance. Dustless surface waivers are not required under § 7-0504 of the PFM. Also, please note that pervious pavement is treated as a pervious or partially pervious surface for hydrologic design but as an impervious surface for application of Chesapeake Bay

Preservation Ordinance development/redevelopment criteria (Table 6.6 Runoff Coefficients and Inlet Times, Footnote No. 5).

- Bioretention Filters and Basins

The values in Table 6.31 (Pretreatment Vegetated Channel Sizing) for sizing vegetated pretreatment channels should not be used. Unfortunately, after adoption of the PFM amendments, it was realized that the values listed in the table were incorrectly transferred from the original source material, Table 3.11-3 in the Virginia Stormwater Management Handbook Volume I. The corrected values are as follows:

Table 6.31
 Pretreatment Vegetated Channel Sizing*

% Impervious	≤ 33%		34% - 66%		≥ 67%	
Channel Slope (4% max)	≤ 2%	≥ 2%	≤ 2%	≥ 2%	≤ 2%	≥ 2%
Min. Length feet (meters)	25 (7.6)	40 (12.2)	30 (9.1)	45 (13.7)	35 (10.7)	50 (15.2)

* 1 acre (0.8 hectare) drainage area. 2 foot (0.6 m) wide channel bottom.

The PFM amendments require inspections of completed facilities after a significant rainfall or artificial flooding to determine if the facility is draining properly. Although not required by the PFM amendments, designers are encouraged to consider lab tests to determine the infiltration rate of the bioretention soil mixture/filter fabric combination prior to installation. This will provide the designer the opportunity to adjust the soil mixture, if needed, to assure adequate drainage through the filter layer. Testing to determine the infiltration rate of the soil mixture/filter fabric combination prior to installation will help minimize post-construction failures.

- Tree Box Filters

The standards for tree box filters include an option for use of a flow rate based design subject to approval by the Director. This is intended to address use of manufactured systems such as the Filterra™ that utilize flow rate based designs. For flow rate based designs, use a design flow rate of 0.5 cfs per impervious acre for 50% phosphorus removal credit and 1.25 cfs per impervious acre for 65% phosphorus removal credit. Based on the Filterra™ manufacturer's performance specification for flow through the filter media (minimum flow rate of 250 ft³/hr for a container with a surface area of 36 ft²), the required filter surface area to drainage areas ratios are 0.006 for 50% phosphorus removal and 0.015 for 65% phosphorus removal. Do not use the manufacturer's recommended ratio of 0.0033.

- Vegetated Roofs

Atypical of most stormwater management facilities, installation of vegetated roofs is performed as part of the building construction rather than the site work. To help insure that the building incorporates the vegetated roof design shown on the site plan, a set of notes is required to be placed on the cover sheet of the site plan alerting the building designer and the building plan reviewers that building design must include the green roof. In addition, the designer of the building must certify on the cover sheet of the building plans that the vegetated roof design on the building plans is in conformance with the vegetated roof design on the approved site plan. The specific content of the notes and certification statement is in § 6-1310.6G. A sample copy of the notes to be placed on the cover sheet of the site plan and the certification statement to be placed on the cover sheet of the building plans is attached.

- Reforestation

Reforested areas are required to be placed in restrictive easements that include limited provisions for management practices necessary to assure the establishment of a healthy forest ecosystem. A sample easement agreement is under development.

LID facilities submitted under the innovative BMP provisions:

For LID facilities (e.g. rain gardens) that were submitted under the innovative BMP provisions (Letter to Industry #01-11), the developer must comply with all the requirements in that Letter to Industry, including the requirement to transfer sufficient funds to the HOA prior to bond release to cover a 20 year maintenance cycle where applicable (facilities located in residential areas that will be maintained by HOAs), in order to be considered grandfathered. The only way to avoid payment of these funds is to revise the design to fully comply with the new PFM requirements prior to beginning construction of the facility and to perform the inspection, certification, and testing specified by the new PFM requirements.

Additional Publications Available:

- [Recommended Plant List for Bioretention Facilities](#)
- [Recommended Plant List for Extensive Vegetated Roofs](#)
- [Recommended Plant List for Intensive Vegetated Roofs](#)
- [Testing Guidelines for Infiltration Facilities](#)

If you have any questions, please contact a stormwater engineer in the Environmental and Site Review Division at **703-324-1720, TTY 711**

Sincerely,

James W. Patteson, PE
Director

Attachments: As Stated

cc: Jimmie D. Jenkins, Director, Department of Public Works and Environmental Service

Location Restrictions for LID Practices

<p>Pervious Pavement</p>	<ul style="list-style-type: none"> • May be used in all non-residential and multi-family residential developments. • May not be used on individual residential infill lots (non-bonded lots). • May not be used in single family detached or attached residential developments unless the Board, in conjunction with the approval of a rezoning, proffered condition amendment, special exception, or special exception amendment, approves the use on HOA “common” property in single family detached residential developments as well as single family attached residential developments.
<p>Bioretention (Rain Gardens) Vegetated Swales</p>	<ul style="list-style-type: none"> • May be used in all non-residential and multi-family residential developments. • May be used in single family detached and attached residential developments. Must be located on outlots. • The Director may approve the location of facilities on individual buildable single-family detached lots for residential subdivisions creating no more than 3 lots on a case-by-case basis. • May be used on individual residential infill lots (non-bonded lots).
<p>Tree Box Filters</p>	<ul style="list-style-type: none"> • May be used in all non-residential and multi-family residential developments. • May be used in single family detached and attached residential developments. Must be located on outlots. • May not be used on individual residential infill lots (non-bonded lots). • May be located in the right-of-way subject to approval by VDOT.
<p>Vegetated Roofs</p>	<ul style="list-style-type: none"> • May be used on all non-residential buildings, parking structures, multi-family residential buildings including condominiums and apartments, and mixed-use buildings with a residential component. • May not be used on single family detached or attached units in residential subdivisions. • May not be used on individual residential infill lots (non-bonded lots).
<p>Reforestation</p>	<ul style="list-style-type: none"> • May be used in all non-residential and multi-family residential developments. Must be placed in restrictive easements. • May be used in single family detached and attached residential developments. Must be located on outlots and placed in restrictive easements. • May not be used on individual residential infill lots (non-bonded lots).

Holding Periods for Conservation Deposits for LID Practices

Pervious Pavement	N/A
Bioretention (Rain Gardens) & Vegetated Swales & Tree Box Filters	All plantings must be well established prior to release of the conservation deposit. No minimum holding period. [§§ 6-1307.10F, 6-1308.10F, & 6-1309.8C]
Vegetated Roofs	Plantings must be well established prior to release of the conservation deposit. The conservation deposit will be held for a minimum of one year after installation of the plantings and shall only be released if 90% coverage is achieved. If 90% coverage is not achieved, the area must be replanted to achieve the minimum required coverage and the conservation deposit will be held for an additional year. [§ 6-1310.5I]
Reforestation	Plantings must be well established prior to release of the conservation deposit. The conservation deposit will be held for a minimum of two years after the initial installation of the plantings. Ninety percent or more of the minimum number of nursery stock trees and shrubs and 67% or more of the initial tree seedling density required by the approved plan shall be viable at the time the conservation deposit is released. If these minimum percentages are not met at the time of inspection, additional nursery stock trees, nursery stock shrubs, and seedlings shall be planted at densities necessary to achieve the required minimum percentages of viability of the initial plantings based on the observed mortality rates. No additional holding period required after replanting. [§ 6-1311.6C]

Vegetated Roof Notes

(The following notes are to be placed on the cover sheet of the site plan.)

Vegetated Roof Notes

This site plan includes a vegetated roof on the proposed building to meet stormwater and water quality control requirements. Construction of the vegetated roof is required with the building. The building plans shall include a statement signed and sealed by the licensed professional submitting the building design that:

- (1) The vegetated roof design on the building plans is in conformance with the vegetated roof design on the approved site plan;
- (2) Additional requirements for all items such as roof membranes, drains, irrigation systems, and safety rails shall comply with the requirements of the Virginia Uniform Statewide Building Code;
- (3) Access to the vegetated roof has been provided in accordance with Public Facilities Manual § 6-1310.3F;
- (4) Provisions for the safety of maintenance and inspection workers have been incorporated in the design of the vegetated roof in accordance with Public Facilities Manual § 6-1310.3G; and
- (5) Manual or automated irrigation has been provided in accordance with Public Facilities Manual § 6-1310.4H.

Vegetated Roof Design Certification

(The following certification statement is to be placed on the cover sheet of the building plans, signed, and sealed by the licensed professional submitting the building design.)

Vegetated Roof Design Certification

This building plan includes a vegetated roof to meet stormwater and water quality control requirements. Construction of the vegetated roof is required with the building.

I hereby certify that:

- (1) The vegetated roof design on the building plans is in conformance with the vegetated roof design on the approved site plan;
- (2) Additional requirements for all items such as roof membranes, drains, irrigation systems, and safety rails shall comply with the requirements of the Virginia Uniform Statewide Building Code;
- (3) Access to the vegetated roof has been provided in accordance with Public Facilities Manual § 6-1310.3F;
- (4) Provisions for the safety of maintenance and inspection workers have been incorporated in the design of the vegetated roof in accordance with Public Facilities Manual § 6-1310.3G; and
- (5) Manual or automated irrigation has been provided in accordance with Public Facilities Manual § 6-1310.4H.

Signature

Date

Name

Virginia license number