

Slow it. Spread it. Sink it! **Introducing the Green Stormwater Infrastructure Toolbox**

Introduction. Last November, the VLCT Municipal Assistance Center released a model stormwater management bylaw focusing on Low Impact Development (LID) and Green Stormwater Infrastructure (GSI) management practices. This model bylaw – plus the new GSI Simplified Sizing Tool and associated fact sheets developed by Stone Environmental, Inc. – comprise the Green Stormwater Infrastructure Toolbox. The toolbox was developed in consultation with VLCT’s Water Resources Program and with support from the Vermont Division of Environmental Conservation’s Clean Water Initiative Program. The GSI Sizing Tool guides applicants in the use of ten types of stormwater management practices to treat stormwater runoff from existing and proposed impervious surfaces on small sites. The tool and associated fact sheets are intended to be used in conjunction with the revised VLCT Model LID/GSI Stormwater Management Bylaw.

This bylaw supersedes the 2008 VLCT Model LID Stormwater Management Bylaw which, although well received at the time, lacked the specificity needed for applicants and review boards to determine how and whether the standards in the bylaw were being reached. The 2015 version of the bylaw is still geared to towns that want to administer stormwater standards for development and re-development projects that fall below the permitting thresholds for State stormwater permitting. Currently, development projects that will have less than one acre of impervious surface after construction are not required to obtain a State permit. The cumulative adverse effects on water quality from the so-called “sub-jurisdictional” projects that fall below the state permitting thresholds can be quite significant. By adopting local stormwater standards such as those provided in the Model LID/GSI Stormwater Management Bylaw, municipalities can take the upper hand in protecting downstream stormwater infrastructure, local water quality, and properties adjacent to development sites.

What is Green Stormwater Infrastructure? Green Stormwater Infrastructure (GSI) is defined in the VLCT Model LID/GSI Stormwater Management Bylaw as “a suite of systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of stormwater runoff.” This is in contrast to so-called “gray infrastructure,” which incorporates engineered stormwater management practices that channel stormwater quickly away from the development site – for example, concrete curb and gutter systems that direct stormwater into storm sewers, detention ponds, or nearby streams, rivers, and lakes. The revised model bylaw also distinguishes between GSI and LID. Where GSI is primarily a practice-based approach that focuses on managing stormwater impacts using natural processes such as infiltration, evapotranspiration, and storage and reuse, LID is primarily a non-structural approach to stormwater management that focuses on avoiding or minimizing stormwater impacts through better site design. In addition to preventing or reducing water pollution through stormwater management, both GSI and LID practices have the added benefit of beautifying our landscapes.

The Proverbial “First Inch.” The ten stormwater management practices included in the GSI Sizing Tool are calibrated to meet the draft Water Quality Treatment Standard expected to be included in the *Vermont Stormwater Management Manual*, which will require treatment of the “first inch” of runoff from proposed impervious surfaces during a 24-hour storm event. The terms “first inch” or “first flush” have become common nomenclature in the stormwater management field. The concept behind this terminology is that pollutants that have collected on impervious surfaces will wash off during the first portion of a storm event. Essentially, the first portion of a given rain event will “flush” the impervious surface of its

pollutants, resulting in stormwater runoff that contains more pollutants than runoff produced later in the storm. Capturing and treating the first one inch of rainfall treats about 90 percent of the pollutants that would otherwise be leaving the site (Schueler, 2000).

In Vermont, about 90 percent of our annual storm events result in one inch or less of rainfall. However, a one-inch rainstorm over one acre in an urban setting with a high percentage of impervious surfaces can produce upwards of 14,900 gallons of runoff, compared to only about 2,700 gallons of runoff in a forested environment. (Impervious surfaces can include rooftops, patios, sidewalks, driveways, parking areas, and roadways.) To put this in perspective, a one-inch storm over the city of Burlington could produce 148,145,300 gallons of runoff, or enough water to fill 225 Olympic size swimming pools!

The VLCT Bylaw and Simplified Sizing Tool The updated VLCT Model LID/GSI Stormwater Management Bylaw is designed to be flexible. The standards in the bylaw can be applicable to what an individual town wants. The model bylaw states that all activities requiring a permit must adhere to the standards. However, towns can manage this in a number of ways, such as limiting applicability to small commercial sites falling below the size threshold for state stormwater permitting, or having the standards apply only to development within a particular overlay district. The model bylaw recommends that applications for development exceeding 2,500 square feet of impervious surface demonstrate that the first inch of rainfall is captured and treated using the GSI Sizing Tool. This impervious surface baseline is a conservative recommendation, and towns may choose to increase it based on local conditions.

Site Design. The Site Design section of the model bylaw focuses on pre-construction LID standards that avoid and minimize disturbance of vulnerable areas and areas that warrant protection. For example, building envelopes must exclude mapped floodplains, river corridors, wetlands, and lake shoreland in conformance with state regulations. The Erosion Prevention and Sediment Control section mirrors the guidance in the Agency of Natural Resources' *Low Risk Site Handbook for Erosion Prevention and Sediment Control*, noting that construction projects involving one acre or more of land disturbance require a construction permit from the State.

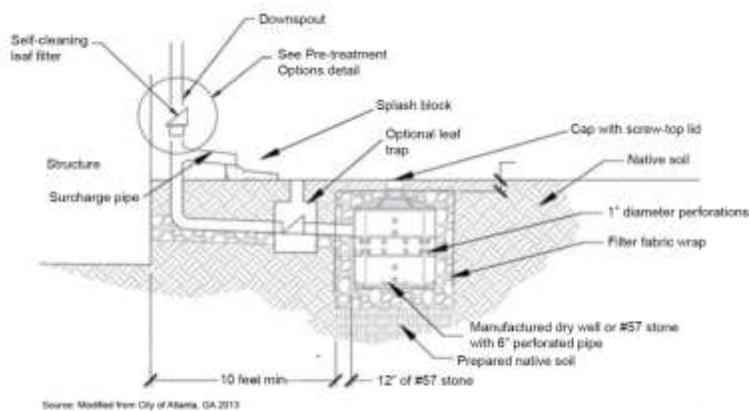
Stormwater Management Standards. The Stormwater Management Standards section focuses on post-construction stormwater runoff from impervious surfaces, and calls for the use of the GSI Sizing Tool. The ten GSI practices included in the GSI Sizing Tool are calculated for a goal of capturing and evapotranspiring, infiltrating, or re-using the volume of runoff generated by the first inch of rain that falls on impervious surfaces. Stormwater management practices can be sized using the GSI Sizing Tool to treat stormwater from up to 10,000 square feet of impervious surface draining to a single point. Up to half an acre of impervious cover may be treated using three or more GSI practices that were sized using the GSI Sizing Tool, as long as no single practice captures and treats runoff from more than 10,000 square feet of impervious cover. Several practices included in the GSI Sizing Tool are only applicable for treating runoff from smaller areas of impervious cover. For example, the "rooftop disconnection" practice, where downspouts are routed to properly graded lawn areas, is limited to a rooftop area of 1,000 square feet per downspout, but multiple downspouts from the same building can be routed to different lawn areas, or coupled with other practices such as rain gardens, infiltration trenches, or dry wells.

Post Construction Soil Depth and Quality. The Post Construction Soil Depth and Quality section includes standards that apply to all disturbed areas that are not covered by an impervious surface or incorporated into a stormwater treatment practice. Undisturbed soil and vegetation provide important stormwater functions such as water infiltration and pollutant adsorption and decomposition. These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod, leaving behind compacted, hard ground. A new standard for maintaining or re-establishing soil depth and quality will also be included in the revised *Vermont Stormwater Management Manual* for larger projects that need State post-construction stormwater permits. In both cases, if the native vegetation and soil are left undisturbed and are protected from compaction during construction, the requirement has been met.

Independent Technical Review. The model bylaw calls for an “independent technical review” for applications for development proposing impervious surfaces exceeding one-half acre (and up to the one-acre threshold for state permitting). This is because the sizing recommendations are meant for practices treating small amounts of impervious cover. As projects (and the individual rooftops or parking lots draining to a single point) get bigger, the risks of that concentrated runoff leading to erosion problems or practice failure also increase. In these cases, the simplified sizing calculations may not be appropriate for use. The authority for towns to require an applicant to pay for reasonable costs of an independent technical review is granted in statute (24 V.S.A. § 4440(d)). Towns can require independent technical reviews for other aspects of an application, but since stormwater management standards can be quite technical, a specific section is included in the model bylaw.

Conclusion. The new GSI Toolbox – incorporating the revised VLCT Model LID/GSI Stormwater Management Bylaw, the GSI Sizing Tool, and associated fact sheets – offers municipalities a clear-cut framework that is simple to administer. The LID/GSI model language is flexible and can easily be incorporated into an existing land use regulation. For assistance, contact Milly Archer, VLCT Municipal Assistance Center Water Resources Coordinator, at 800-649-7015 or marcher@vlct.org. All of the components of the GSI Toolbox can be accessed online at www.vlct.org/municipal-assistance-center/water-resources-assistance/.

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A drywell includes a manufactured tank, gravel jacket, and filter fabric.