

# Low Impact Development LID and GSI Stormwater Management Bylaw

## I. Authority

- This bylaw is adopted by the Town of \_\_\_\_\_ under the authority of 24 V.S.A. § 4410 and 24 V.S.A. § 4414(9).

## II. Purpose

- To minimize and/or control the quantity and quality of stormwater runoff.
- To promote stormwater management methods that maintain pre-development hydrology and drainage patterns through project layout, site design, and best management practices that manage stormwater runoff as close to the source as possible.
- To limit clearing and grading to the minimum needed for construction and minimize impacts to historically undisturbed vegetation and native trees.
- To prevent soil erosion and sedimentation resulting from construction sites and non-point source pollution associated with new development and redevelopment.
- To protect natural resources, particularly streams, lakes, wetlands, floodplains and other aquatic systems on the development site and elsewhere from degradation that could be caused by construction activities and post-construction conditions.
- To promote public safety from flooding and streambank erosion, reduce public expenditures in removing sediment from stormwater drainage systems and natural resource areas, and to prevent damage to municipal infrastructure from inadequate stormwater controls.

## III. Scope and Applicability

- The requirements of this regulation shall apply to land disturbance, development and any construction activities requiring a municipal land use permit.
- Factors to be considered in determining the types of controls necessary shall include pre-development site and runoff conditions, vegetation and ground cover, slope and drainage patterns, soil types, the percentage of land covered in impervious surfaces, distances to streams and other surface waters, and impact on adjoining properties.
- The use of LID site design approaches and GSI best management practices to reduce runoff rates, volumes and pollutant loads shall be implemented to the maximum extent practical given the site's soil characteristics, slope, and other relevant factors. (See Simplified GSI Sizing Tool for BMPs and calculations.)
- Before proposing to use gray stormwater infrastructure practices that channel stormwater away from the development site and into storm sewers, detention ponds or nearby waterbodies, applicants must demonstrate why the use of LID design approaches and GSI best management practices are not possible given the site's soil characteristics, slope, and other relevant factors.

## IV. Definitions

*Note: Towns should review existing definitions prior to adopting any of the following definitions to avoid duplication of conflicting definitions.*

- **Appropriate Municipal Panel (AMP):** Any municipal body or panel designated in the bylaw to review development applications or to hear appeals. An AMP may include a planning commission, board of adjustment, development review board, or in some cases the legislative body.

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- **Best Management Practice (BMP):** A schedule of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce water pollution, including, but not limited to, the stormwater treatment practices (STPs) set forth in the Vermont Stormwater Management Manual.
- **Building Envelope:** The area on a lot that encompasses development as defined below including the construction area.
- **Development:** Any activity involving land grading or alterations to the landscape that creates, expands or changes the location of impervious surfaces or alters the natural drainage of a site.
- **Duff Layer:** Leaf litter plus small fragments of plants and organic debris that provide a spongy substrate that absorbs the energy of falling water and allows runoff to infiltrate soil.
- **Erosion:** The detachment and movement of soil, rock, or rock fragments by water, wind, ice or gravity.
- **Floodplain:** The area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any give year as determined by the Federal Emergency Management Agency. The 1% annual chance flood is also referred to as the base flood or 100-year flood.
- **Functional Hydrologic Areas:** Natural areas that must be mapped prior to any land disturbance, development and any construction activities requiring a municipal land use permit, including floodplains, river corridors, wetlands, streams, lakes, riparian buffers, forested areas, well-drained soils, natural drainage ways, steep slopes, and ridgelines.
- **Gray Stormwater Infrastructure:** Engineered stormwater management practices that channel stormwater quickly away from the development site such as standard concrete curb and gutter systems that channel stormwater into storm sewers, detention ponds or nearby waterbodies.
- **Green Stormwater Infrastructure (GSI):** 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. GSI is a structural approach to stormwater management that focuses on managing stormwater impacts using natural processes such as infiltration, evapotranspiration, and storage and reuse. In contrast to gray stormwater infrastructure, GSI is used in a decentralized fashion to treat stormwater as close to the source as possible.
- **Impervious Surface:** Man-made surfaces, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways and walkways, from which precipitation runs off rather than infiltrates.
- **Low Impact Development (LID):** An innovative land planning and design approach which seeks to maintain a site's pre-development ecological and hydrological function through the protection, enhancement, or mimicry of natural processes. LID is primarily a nonstructural approach to stormwater management that focuses on avoiding and minimizing stormwater impacts through better site design.
- **Pervious Surface:** Any material or structure on or above the ground that permits water to infiltrate into the underlying soil. Naturally pervious surfaces may become less pervious through the process of compaction.
- **River Corridor:** The land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is

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necessary for the natural maintenance or natural restoration of dynamic equilibrium conditions and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures.

- **Redevelopment:** Reuse of a site or structure with existing impervious surfaces or reconstruction of an impervious surface where an impervious surface currently exists.
- **Sediment:** Solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin.
- **Simplified GSI Sizing Tool:** A suite of tools utilized to size, and aid in the review of, green stormwater infrastructure BMPs, including sizing factors for a variety of GSI practices based on impervious cover, soils, precipitation, flow and pollutant removal goals.
- **Stormwater Runoff:** Precipitation from rain and snowmelt events that flows over land or impervious surfaces and is not evaporated or absorbed into the ground.

### V. Site Design – Pre-Construction

- Minimize land disturbance.
  - Maintain the natural soil structure and vegetative cover that are often critical components of maintaining the hydrologic functions of natural infiltration, bioretention, flow attenuation, evapotranspiration, and pollutant removal.
  - Protect, or improve, natural resources to reduce the needs for environmental mitigation, future environmental restoration, and cumulative flow and water quality impacts of unnecessary disturbances within the watershed.
  - Minimize the disturbance of natural surface and groundwater drainage features and patterns, discharge points and flow characteristics, natural infiltration and evapotranspiration patterns and characteristics, natural stream channel stability, floodplain conveyance, and wetland function.
  - Designate a building envelope. The extent and location of construction, clearing, structures, parking areas and associated site improvements shall be limited to the designated building envelope. The building envelope shall be sized and delineated to accommodate necessary compaction incurred during construction. (See Simplified GSI Sizing Tool for calculations.)
  - Reduce grading and compaction by applying selective grading design methods to provide final grading patterns that preserve existing topography where it most benefits natural hydrologic functions and, where needed, evenly distributes runoff and minimizes concentrated flow. Follow the natural contours of the landscape to the maximum extent possible.
  - Consider the scale and placement of buildings and other infrastructure to minimize impact to natural hydrologic features.
- Preserve natural drainage features.
  - Priority shall be given to maintaining existing surface waters and systems, including, but not limited to, perennial and intermittent streams, wetlands, vernal pools, and natural swales.
    - Existing site hydrology shall not be modified so as to disrupt onsite and adjacent surface waters. The applicant must provide evidence that this standard can be achieved and maintained over time.

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- Where roadway or driveway crossings of surface waters cannot be avoided, disturbance to the surface water shall be minimized, hydrologic flows shall be maintained, there shall be no direct discharge of runoff from the roadway to the surface water, and the area shall be re-vegetated post-construction.
- Stream and wetland crossings shall be eliminated whenever possible. When necessary, stream and wetland crossings shall comply with state recommended design standards to minimize impacts to flow and animal passage.
- Functional hydrologic areas shall not be included in a building envelope. Specifically, building envelopes shall be located to exclude the following:
  - Areas mapped as Floodplain by FEMA or ANR.
  - Areas within a mapped river corridor.
  - For streams without mapped river corridors, the building envelope shall exclude land at least 100 feet from streams with watersheds less than or equal to two square miles, and at least 50 feet of that setback shall maintain a naturally vegetated buffer.
  - Wetlands, in conformance with state regulations.
  - Lake shoreland, in conformance with state regulations.
- Maximize retention of native forest cover and vegetation and restore disturbed vegetation to intercept, evaporate, and transpire precipitation.
  - Roads, driveways, and utilities shall be located and designed to avoid the fragmentation of natural features.
  - Applicants may be required to preserve, plant, and/or maintain riparian buffers, trees, hedges, ground cover and other pervious surfaces in one or more areas of land to be developed in order to provide stormwater infiltration and management.

### **VI. Erosion Prevention and Sediment Control – EPSC**

- Minimize sediment runoff from construction disturbance by using control measures (EPSC measures) such as vegetated strips, diversion swales, sediment traps and basins, check dams, stabilized construction entrances, dust control and silt fences.
- Implement the applicable EPSC measures found in the ANR “Low Risk Site Handbook for Erosion Prevention and Sediment Control.”
  - Control water within the construction area, and allow it to infiltrate. Install EPSC measures before excavation or fill activities begin. Hay bales shall not be used as check dams due to their high failure rates.
  - Intercept and direct runoff from above the construction site around the disturbed area.
  - Immediately seed and mulch or apply sod to the disturbed area at the conclusion of each phase of construction or at the conclusion of construction. The [AMP] may require project phasing to minimize the extent of soil disturbance and erosion during each phase of site development.
- The applicant shall follow the erosion prevention and sediment control practices for construction that occurs from October 15th to May 15th found in the “Low Risk Site Handbook for Erosion Prevention and Sediment Control.”

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- Construction projects involving one acre or more of land disturbance require a construction permit from the state.

### VII. Stormwater Management Standard – Post Construction

- Applications for development exceeding 2,500 square feet\* of impervious surface shall comply with the stormwater management standards set forth herein. [*\* The 2,500 square foot impervious regulatory baseline is a conservative recommendation. Towns may choose to increase this threshold based on local conditions.*]
- Stormwater runoff from impervious surfaces exceeding 2,500 square feet and up to one-half acre shall be routed through one or more appropriate BMPs based on soils, precipitation, flow, pollutant removal requirements, and the unique hydrologic and geologic conditions of the site.
- BMPs shall be sized and designed to capture 90% of the annual storm events, or the first inch of rainfall. See Simplified GSI Sizing Tool for methods and calculations.
- Applications for development with impervious surfaces exceeding one-half acre require an independent technical review as outlined in Section XI of this bylaw.
- Landscaped areas shall be designed in a manner that guides stormwater from on-site impervious streets, parking areas, sidewalks and walkways to vegetated areas or approved retention areas in order to promote on-site water retention and filtration.
- At the discretion of the [AMP], parking spaces may be required to be constructed of a pervious surface (i.e. grass, pervious asphalt, pervious pavers).
- Applicants shall evaluate the minimum widths of all streets and driveways and demonstrate that the proposed width is the narrowest possible necessary to conform to safety and traffic concerns and requirements.

### VIII. Previously Developed Sites

- Redevelopment and reuse of previously developed sites is encouraged. An applicant proposing to redevelop or reuse a previously developed site exceeding 2,500 square feet and up to one-half acre of impervious surface, or proposing to expand an existing impervious area such that the total resulting impervious area exceeds 2,500 square feet and up to one-half acre, shall meet the Stormwater Management Standard set forth in Section VII to the maximum extent possible as determined by the [AMP].
- Applications for redevelopment or reuse of a previously developed site with impervious surfaces exceeding one-half acre require an independent technical review as outlined in Section XI of this bylaw.
- An applicant proposing to redevelop or expand an existing impervious such that the total resulting impervious area exceeds 2,500 square feet of impervious surface shall provide design calculations and other back-up materials necessary to demonstrate how the previously developed site will comply with the requirements of this bylaw. See Simplified GSI Sizing Tool for methods and calculations.
- Redevelopment or reuse of a site shall not infiltrate stormwater through materials or soils containing regulated or hazardous substances.

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### IX. Post-Construction Soil Depth and Quality

All site areas not covered by impervious surface, or incorporated into a structural stormwater treatment practice, or engineered as structural fill or slope once development is complete, shall meet the following minimum soil depth and quality requirements:

- Retain the duff layer and native topsoil undisturbed to the maximum extent practicable.
- In areas requiring grading, the duff layer and topsoil shall be removed and stockpiled on-site in a designated, controlled area, not adjacent to surface waters, wetlands, floodplains, or river corridors, and reapplied on-site.
- At project completion, the following quality requirements shall be demonstrated:
  - a topsoil layer with a minimum organic matter content of 10% dry weight in planting beds and 5% organic matter content in turf areas; and
  - a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil.
  - The topsoil layer shall have a minimum depth of 8 inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria.
  - Subsoils below the topsoil layer shall be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.
- If stockpiled existing soil is not sufficient to amend the graded areas, import and establish a minimum 8 inch topsoil layer with subsoils below scarified to at least 4 inches to allow for some incorporation of the topsoil layer.
- The resulting soil shall be conducive to the type of vegetation to be established.
- The [AMP] may require a site specific plan for soil management identifying where the native soil and vegetation will be stockpiled and how the soil depth and quality will be re-established in graded areas.

### X. Supplemental Application Materials

*[These application requirements are in addition to the town's municipal land use application requirements set forth in Chapter 117.]*

- The applicant shall provide an inventory of the functional hydrologic areas of the proposed development site, including floodplains, river corridors, wetlands, streams, lakes, riparian buffers, forested areas, well-drained soils and natural drainage ways.
- The applicant shall provide a stormwater management plan identifying the building envelope including the construction disturbance area and demonstrate that stormwater runoff is minimized through the use of natural drainage systems and on-site infiltration and treatment techniques. The plan shall demonstrate that functional hydrologic areas described in the inventory above are retained and protected, and shall include provisions for the maintenance of GSI systems and practices.
- Existing site hydrology shall not be modified so as to disrupt on-site and adjacent surface waters. The applicant must provide evidence that this standard can be achieved and maintained over time.
- The applicant shall demonstrate how the proposed stormwater control(s) will comply with the requirements of this ordinance including the control of peak flow and total volume of runoff and protection of water quality. The applicant shall provide design calculations and other back-up material necessary at the discretion of the [AMP]. (See Simplified GSI Sizing Tool for calculations.)

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### **XI. Independent Technical Review**

*[This condition set forth in Chapter 117 §4440(d) allows the [AMP] to require an applicant to pay for reasonable costs of an independent technical review of the application as long as they have procedures and standards in place. We recommend that these technical review provisions be maintained in a separate stand alone document including procedures, fee schedules and standards for applying this requirement.]*

- To assist in evaluating an application, the [AMP] may require an independent technical review at any point in the process of one or more proposed aspects of a proposed development, prepared by a qualified professional acceptable to the [AMP] and funded by the applicant.
- In accordance with Chapter 117 §4440(d), the [AMP] may impose reasonable fees, in addition to application fees, to cover independent technical review(s) of an application, including but not limited to engineering review, legal review of any associated legal documentation, design review and/or to conduct inspections to ensure compliance with approved plans.
  - In the event the [AMP] believes they require independent technical review for the diligent, application specific pursuit of their work, they shall so determine by majority vote of the [AMP]. That vote shall occur during the public review or hearing for that application.
  - In the event that the [AMP] directs a technical review to take place, the Town shall obtain an estimate of the review costs. The applicant and/or owner shall be responsible for paying the estimated costs of the review to the Town. The technical review will not take place until the Town receives the funds. In the event that the review ends up costing less than the estimate, the Town shall reimburse the applicant and/or owner. Should the review be more than the estimated cost, the applicant and/or owner shall be required to pay the additional costs.
  - The [AMP] may table review of the application pending receipt of an independent technical review. An application for a zoning permit or approval by the [AMP] will not be considered complete and therefore approvals will not be issued until such time as all costs for the technical review are paid in full. No decision by the [AMP] or Administrative Officer may be issued until the review costs are paid in full.
  - In the event of failure to pay a balance due, the [AMP] may deem the application incomplete and deny the application. The application may be re-submitted without changes within 6 months of the denial upon receipt of the balance due. If resubmitted, time frames for review and approval will start anew from the date of receipt of the balance and all application fees shall be paid.
  - In the event that an applicant or owner disagrees with the determination of the [AMP] that a technical review is warranted, the [AMP] may render the application incomplete and deny the application.