



SOUTHEAST WATERSHED ALLIANCE

POST CONSTRUCTION STORMWATER MANAGEMENT STANDARDS

**Southeast Watershed Alliance
Model Stormwater Standards, 2017 update**

Prepared by the Rockingham Planning Commission
and
University of New Hampshire Stormwater Center

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**SOUTHEAST WATERSHED ALLIANCE
POST CONSTRUCTION STORMWATER MANAGEMENT STANDARDS
FOR SITE PLAN REVIEW REGULATIONS**

ELEMENT A: Purpose and Goals

1. Purpose and Goals. The purpose of post construction stormwater management standards is to provide reasonable guidance for the regulation of stormwater runoff to protect local natural resources from degradation and prevent adverse impacts to adjacent and downstream land, property, facilities and infrastructure. These standards regulate discharges from stormwater and runoff from land development projects and other construction activities to control and minimize increases in stormwater runoff rates and volumes, soil erosion, stream channel erosion, and nonpoint source pollution associated with stormwater runoff.

The goal of these standards is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public in the Town of { }. This regulation seeks to meet that goal through the following objectives:

- a. Minimize increases in stormwater runoff from any development to reduce flooding, siltation and streambank erosion and maintain the integrity of stream channels.
- b. Minimize increases in nonpoint source pollution caused by stormwater runoff from development which would otherwise degrade local water quality.
- c. Minimize the total volume of surface water runoff which flows from any specific site during and following development to not exceed the pre-development hydrologic condition to the maximum extent practicable as allowable by site conditions.
- d. Reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, through stormwater management controls and to ensure that these management controls are properly maintained and pose no threat to public safety or cause excessive municipal expenditures.
- e. Protect the quality of groundwater resources, surface water bodies and wetlands.

ELEMENT B: Minimum Thresholds for Applicability

Insert the following Sections #1 and #2 for SITE PLAN REVIEW REGULATIONS:

1. The post-construction stormwater management standards apply to any development or redevelopment project which are subject to Site Plan Review and disturbs more than 5,000 square feet or disturbs more than 2,500 square feet within 100 feet of a surface water body.
2. The Planning Board may grant a waiver from these regulations if the amount of the total site impervious cover created does not exceed 5,000 square feet upon a showing by the applicant as to why these regulations should not apply.
3. The following activities are considered exempt from these regulations:
 - i. Agricultural and forestry practices located outside wetlands and surface water setbacks and/or buffers.
 - ii. Resurfacing and routine maintenance of roads and parking lots.

- iii. Exterior and interior alterations and maintenance to existing buildings and structures.

Insert the following Sections #1 and #2 for SUBDIVISION REGULATIONS:

1. The Post-Construction Stormwater Management Standards apply to subdivisions that result in creation of a private road or a road intended for adoption as a public road. All stormwater runoff generated from the proposed private or public roadway(s) and any other stormwater runoff contributing to the roadway stormwater management system(s) shall be managed and treated in full compliance with these standards.
2. For subdivisions comprising lots with frontage on existing private or public roadways, roadside drainage and any other stormwater runoff from the new lots discharging to the roadside drainage system must be managed for: stormwater runoff quantity/volume; and water quality treatment if stormwater is discharged to the municipality's drainage system subject to the EPA MS4 permit.

ELEMENT C: Stormwater Management for New Development

1. All proposed stormwater management practices and treatment systems shall meet the following performance standards.
 - a. Stormwater management and erosion and sediment control practices shall be located outside any specified buffer zones unless otherwise approved by the Planning Board. Alternatives to stream and wetland crossings that eliminate or minimize environmental impacts shall be considered whenever possible.
 - b. Low Impact Development (LID) site planning and design strategies must be used to the maximum extent practicable (MEP) to reduce stormwater runoff volumes, protect water quality, and maintain predevelopment site hydrology. Low Impact Development (LID) techniques with the goals of protecting water quality, maintaining predevelopment site hydrology. Low Impact Development (LID) techniques that preserve existing vegetation, reduce the development footprint, minimize or disconnect impervious area, and use enhanced stormwater BMP's (such as raingardens, bioretention systems, tree box filters, and similar stormwater management landscaping techniques) shall be incorporated into landscaped areas. Capture and reuse of stormwater is strongly encouraged. The applicant must document in writing why LID strategies are not appropriate when not used to manage stormwater.
 - c. All stormwater treatment areas shall be planted with native plantings appropriate for the site conditions: trees, grasses, shrubs and/or other native plants in sufficient numbers and density to prevent soil erosion and to achieve the water quality treatment requirements of this section.
 - e. Salt storage areas shall be fully covered with permanent or semi-permanent measures and loading/offloading areas shall be located and designed to not drain directly to receiving waters and maintained with good housekeeping measures in accordance with NH DES published guidance. Runoff from snow and salt storage areas shall enter treatment areas as specified above before being discharged to receiving waters or allowed to infiltrate into the groundwater. See NHDES published guidance fact sheets on road salt and water quality, and snow disposal at <http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/index.htm>.
 - f. Surface runoff shall be directed into appropriate stormwater control measures designed for treatment and/or filtration to the maximum extent practicable and/or captured and reused onsite.

- g. All newly generated stormwater from new development shall be treated on the development site. A development plan shall include provisions to retain natural predevelopment watershed areas on the site by using the natural flow patterns.
 - h. Runoff from impervious surfaces shall be treated to achieve at least 80% removal of Total Suspended Solids and at least 50% removal of both total nitrogen and total phosphorus using appropriate treatment measures, as specified in the NH Stormwater Manual. Volumes 1 and 2, December 2008, as amended or other equivalent means. Where practical, the use of natural, vegetated filtration and/or infiltration practices or subsurface gravel wetlands for water quality treatment is preferred given its relatively high nitrogen removal efficiency. All new impervious area draining to surface waters impaired by nitrogen, phosphorus or nutrients shall be treated with stormwater BMP's designed to optimize pollutant removal efficiencies based on design standards and performance data published by the UNH Stormwater Center and/or included in the latest version of the NH Stormwater Manual.
 - i. Measures shall be taken to control the post-development peak runoff rate so that it does not exceed pre-development runoff. Drainage analyses shall include calculations comparing pre- and post-development stormwater runoff rates (cubic feet/second) and volumes (cubic feet) for the 1-inch rainstorm and the 2-year, 10-year, 25-year, and 50-year 24-hour storm events. Similar measures shall be taken to control the post-development runoff volume to infiltrate the groundwater recharge volume GR_v according to the following ratios of Hydrologic Soil Group (HSG) type versus infiltration rate multiplier: HSG-A: 0.4; HSG-B: 0.25; HSG-C: 0.1; HSG-D: 0.00. For sites where infiltration is limited or not practicable, the applicant must demonstrate that the project will not create or contribute to water quality impairment.
 - j. The design of the stormwater drainage systems shall provide for the disposal of stormwater without flooding or functional impairment to streets, adjacent properties, downstream properties, soils, or vegetation.
 - k. The design of the stormwater management systems shall account for upstream and upgradient runoff that flows onto, over, or through the site to be developed or re-developed, and provide for this contribution of runoff.
 - n. Whenever practicable, native site vegetation shall be retained, protected, or supplemented. Any stripping of vegetation shall be done in a manner that minimizes soil erosion.
2. Submission Requirements for Stormwater Management Report and Plans.
- a. All applications shall include a comprehensive Stormwater Management Plan (SMP). The SMP shall include a narrative description and an Existing Conditions Site Plan showing all pre-development impervious surfaces, buildings and structures; surface water bodies and wetlands; drainage patterns, sub-catchment and watershed boundaries; building setbacks and buffers, locations of various hydrologic group soil types, mature vegetation, land topographic contours with minimum 2-foot intervals and spot grades where necessary for sites that are flat.
 - b. The SMP shall include a narrative description and a Proposed Conditions Site Plan showing all post-development proposed impervious surfaces, buildings and structures; temporary and permanent stormwater management elements and best management practices (BMP), including BMP GIS coordinates and GIS files; important hydrologic features created or preserved the site; drainage patterns, sub-catchment and watershed boundaries; building setbacks and buffers; proposed tree clearing and topographic contours with minimum 2-foot intervals. The plans shall provide calculations and identification of the total area of disturbance proposed on the site (and off site if applicable) and total area of new impervious surface created. A summary of the drainage

analysis showing a comparison of the estimated peak flow and volumes for various design storms (see Table 1. Stormwater Infrastructure Design Criteria) at each of the outlet locations shall be included.

- c. The SMP shall describe the general approach and strategies implemented, and the facts relied upon, to meet the goals of Element A and Element C.: The SWP shall include design plans and/or graphical sketch(es) of all proposed above ground LID practices.
 - d. The SMP shall include calculations of the change in impervious area, pollution loading and removal volumes for each best management practice, and GIS files containing the coordinates of all stormwater infrastructure elements (e.g. catch basins, swales, detention/bioretention areas, piping).
 - e. The SMP shall include a description and a proposed Site Plan showing proposed erosion and sediment control measures, limits of disturbance, temporary and permanent soil stabilization measures in accordance with the NHDES Stormwater Manual Volume 3 (most recent version) as well as a construction site inspection plan including phased installation of best management practices and final inspection upon completion of construction.
 - f. The SMP shall include a long-term stormwater management BMP inspection and maintenance plan (see Element E) that describes the responsible parties and contact information for the qualified individuals who will perform future BMP inspections. The inspection frequency, maintenance and reporting protocols shall be included.
 - g. The SMP shall describe and identify locations of any proposed deicing chemical and/or snow storage areas. SMP will describe how deicing chemical use will be minimized or used most efficiently.
 - h. In urbanized areas that are subject to the EPA MS4 Stormwater Permit and will drain to chloride-impaired waters, any new developments and redevelopment projects shall submit a description of measures that will be used to minimize salt usage, and track and report amounts applied using the UNH Technology Transfer Center online tool (<http://www.roadsalt.unh.edu/Salt/>) in accordance with Appendix H of the NH MS4 Permit.
2. General Performance Criteria for Stormwater Management Plans.
- a. All applications shall apply site design practices to reduce the generation of stormwater in the post-developed condition, reduce overall impervious surface coverage, seek opportunities to capture and reuse and minimize and discharge of stormwater to the municipal stormwater management system.
 - b. Water Quality Protection.
 - i. No stormwater runoff generated from new development or redevelopment shall be discharged directly into a jurisdictional wetland or surface water body without adequate treatment.
 - ii. All developments shall provide adequate management of stormwater runoff and prevent discharge of stormwater runoff from creating or contributing to water quality impairment.
 - c. Onsite groundwater recharge rates shall be maintained by promoting infiltration through use of structural and non-structural methods. The annual recharge from the post development site shall maintain or exceed the annual recharge from pre-development site conditions. Capture and reuse of stormwater runoff is encouraged in instances where groundwater recharge is limited by site

conditions All stormwater management practices shall be designed to convey stormwater to allow for maximum groundwater recharge. This shall include, but not be limited to:

- i. Maximizing flow paths from collection points to outflow points.
 - ii. Use of multiple best management practices.
 - iii. Retention of and discharge to fully vegetated areas.
 - iv. Maximizing use of infiltration practices.
 - v. Stormwater System Design Performance Standards.
- d. Stormwater system design, performance standards and protection criteria shall be provided as prescribed in Table 1 below. Calculations shall include sizing of all structures and best management practices, including sizing of emergency overflow structures based on assessment of the 100-year 24-hour frequency storm discharge rate.
 - e. The sizing and design of stormwater management practices shall utilize new precipitation data from the Northeast Region Climate Center (NRCC) or the most recent precipitation atlas published by the National Oceanic and Atmospheric Administration (NOAA) for the sizing and design of all stormwater management practices. See the NRCC website at <http://precip.eas.cornell.edu/>.
 - f. All stormwater management practices involving bioretention and vegetative cover as a key functional component must have a landscaping plan detailing both the type and quantities of plants and vegetation to be in used in the practice and how and who will manage and maintain this vegetation. The use of native plantings appropriate for site conditions is strongly encouraged for these types of stormwater treatment areas. The landscaping plan must be prepared by a registered landscape architect, soil conservation district office, or another qualified professional.
3. Spill Prevention, Control and Countermeasure (SPCC) Plan.
Any existing or otherwise permitted use or activity having regulated substances in amounts greater than five gallons, shall submit to the local official such as Fire Chief, Emergency Response Official a SPCC plan for review and approval. The Plan will include the following elements:
 - a. Disclosure statements describing the types, quantities, and storage locations of all regulated substances that will be part of the proposed use or activity.
 - b. Owner and spill response manager's contact information.
 - c. Location of all surface waters and drainage patterns.
 - d. A narrative describing the spill prevention practices to be employed when normally using regulated substances.
 - e. Containment controls, both structural and non-structural.
 - f. Spill reporting procedures, including a list of municipal personnel or agencies that will be contacted to assist in containing the spill, and the amount of a spill requiring outside assistance and response.
 - g. Name of a contractor available to assist in spill response, contaminant, and cleanup.
 - h. The list of available clean-up equipment with instructions available for use on-site and the names of employees with adequate training to implement containment and clean up response.

ELEMENT D: Stormwater Management for Redevelopment

1. Redevelopment (as applicable to this stormwater regulation) means:

- a. Any construction, alteration, or improvement that disturbs existing impervious area (including demolition and removal of road/parking lot materials down to the erodible subbase) or expands existing impervious cover by any amount, where the existing land use is commercial, industrial, institutional, governmental, recreational, or multifamily residential.
- b. Any redevelopment activity that results in improvements with no increase in impervious area shall be considered redevelopment activity under this regulation if capital cost of improvements is greater than 30% of the appraised property value.
- c. Any new impervious area over portions of a site that are currently pervious.

The following activities are not considered redevelopment:

- Interior and exterior building renovation.
 - Resurfacing of an existing paved surface (e.g. parking lot, walkway or roadway).
 - Pavement excavation and patching that is incidental to the primary project purpose, such as replacement of a collapsed storm drain.
 - Landscaping installation and maintenance.
2. Redevelopment applications shall comply with the requirements of Sections C.2 Submission Requirements for Stormwater Management Report and Plans, C.3 General Performance Criteria for Stormwater Management Plans, and C.4 Spill Prevention, Control and Countermeasure (SPCC) Plan.
 3. For sites meeting the definition of a redevelopment project and having less than 60% existing impervious surface coverage, the stormwater management requirements will be the same as other new development projects. The applicant must satisfactorily demonstrate that impervious area is minimized, and LID practices have been implemented on-site to the maximum extent practicable.
 4. For sites meeting the definition of a redevelopment project and having more than 60% existing impervious surface area, stormwater shall be managed for water quality in accordance with one or more of the following techniques, listed in order of preference:
 - a. Implement measures onsite that result in disconnection or treatment of 100% of the additional proposed impervious surface area and at least 30% of the existing impervious area and pavement areas, preferably using filtration and/or infiltration practices.
 - b. If resulting in greater overall water quality improvement on the site, implement LID practices to the maximum extent practicable to provide treatment of runoff generated from at least 60% of the entire developed site area.
 4. Runoff from impervious surfaces shall be treated to achieve at least 80% removal of Total Suspended Solids and at least 50% removal of both total nitrogen and total phosphorus using appropriate treatment measures, as specified in the NH Stormwater Manual. Volumes 1 and 2, December 2008, as amended or other equivalent means. All new impervious area draining to surface waters impaired by nitrogen, phosphorus or nutrients shall be treated with stormwater BMP's designed to optimize pollutant removal efficiencies based on design standards and performance data published by the UNH Stormwater Center and/or included in the latest version of the NH Stormwater Manual.

Option to Allow for Off-Site Mitigation:

1. In cases where the applicant demonstrates, to the satisfaction of the planning board, that on-site treatment has been implemented to the maximum extent possible or is not feasible, off-site mitigation will be an acceptable alternative if implemented within the same subwatershed, within the project's drainage area or within the drainage area of the receiving water body. To comply with

local watershed objectives the mitigation site would be preferably situated in the same subwatershed as the development and impact/benefit the same receiving water.

2. Off-site mitigation shall be equivalent to no less than the total area of impervious cover NOT treated on-site. Treatment of the impervious area shall comply with all standards of this regulation.
3. An approved off-site location must be identified, the specific management measures identified, and if not owned by the applicant, with a written agreement with the property owner(s) and an implementation schedule developed in accordance with planning board review. The applicant must also demonstrate that there is no downstream drainage or flooding impacts that would result from not providing on-site management for large storm events.

ELEMENT E: Stormwater Management Plan and Site Inspections

1. The applicant shall provide that all stormwater management and treatment practices have an enforceable operations and maintenance plan and agreement to ensure the system functions as designed. This agreement will include all maintenance easements required to access and inspect the stormwater treatment practices, and to perform routine maintenance as necessary to ensure proper functioning of the stormwater system. The operations and maintenance plan shall specify the parties responsible for the proper maintenance of all stormwater treatment practices. The operations and maintenance shall be provided to the Planning Board as part of the application prior to issuance of any local permits for land disturbance and construction activities.
2. The applicant shall provide legally binding documents for filing with the registry of deeds which demonstrate that the obligation for maintenance of stormwater best management practices and infrastructure runs with the land and that the Town has legal access to inspect the property to ensure their proper function or maintain onsite stormwater infrastructure when necessary to address emergency situations or conditions.
3. The property owner shall bear responsibility for the installation, construction, inspection, and maintenance of all stormwater management and erosion control measures required by the provisions of these regulations and as approved by the Planning Board, including emergency repairs completed by the town.

ELEMENT F. Stormwater Management Plan Recordation

1. Stormwater management and sediment and erosion control plans shall be incorporated as part of any approved site plan. A Notice of Decision acknowledging the Planning Board approval of these plans shall be recorded at the Registry of Deeds. The Notice of Decision shall be referenced to the property deed (title/book/page number) and apply to all persons that may acquire any property subject to the approved stormwater management and sediment control plans. The Notice of Decision shall reference the requirements for maintenance pursuant to the stormwater management and erosion and sediment control plans as approved by the Planning Board.
2. The applicant shall submit as-built drawings of the constructed stormwater management system following construction.
3. Easements:

Where a development is traversed by or requires the construction of a watercourse or a drainage way, an easement to the Town of adequate size to enable construction, reconstruction and required maintenance shall be provided for such purpose. Easements to the Town shall also be provided for the purpose of periodic inspection of drainage facilities and BMPs should such inspections by the Town become necessary. All easements shall be recorded at the County Registry of Deeds.

ELEMENT G. Inspection and Maintenance Responsibility

1. Municipal staff or their designated agent shall be granted site access to complete routine inspections to ensure compliance with the approved stormwater management and sediment and erosion control plans. Such inspections shall be performed at a time agreed upon with the landowner.
 - a. If permission to inspect is denied by the landowner, municipal staff or their designated agent shall secure an administrative inspection warrant from the district or superior court under RSA 595-B Administrative Inspection Warrants. Expenses associated with inspections shall be the responsibility of the applicant/property owner.
 - b. If violations or non-compliance with a condition(s) of approval are found on the site during routine inspections, the inspector shall provide a report to the Planning Board documenting these violations or non-compliance including recommend corrective actions. The Planning Board shall notify the property owner in writing of these violations or non-compliance and corrective actions necessary to bring the property into full compliance. The Planning Board, at their discretion, may recommend to the Board of Selectmen to issue a stop work order if corrective actions are not completed within 10 days.
 - c. If corrective actions are not completed within a period of 30 days from the Planning Board or Board notification, the Planning Board may exercise their jurisdiction under RSA 676:4-a Revocation of Recorded Approval.
2. The applicant shall bear final responsibility for the installation, construction, inspection, and disposition of all stormwater management and erosion control measures required by the Planning Board. Site development shall not begin before the Stormwater Management Plan receives written approval by the Planning Board.
3. The municipality retains the right, though accepts no responsibility, to repair or maintain stormwater infrastructure if: a property is abandoned or becomes vacant; and in the event a property owner refuses to repair infrastructure that is damaged or is not functioning properly.

OPTIONAL STANDARD

4. Landowners shall be responsible for submitting an annual report to the Planning Board by September 1 each year by a qualified engineer that all stormwater management and erosion control measures are functioning per the approved stormwater management plan. The annual report shall note if any stormwater infrastructure has needed any repairs other than routine maintenance and the results of those repairs. If the stormwater infrastructure is not functioning per the approved stormwater management plan the landowner shall report on the malfunction in their annual report and include detail regarding when the infrastructure shall be repaired and functioning as approved.

If no report is filed by September 1, municipal staff or their designated agent shall have site access to complete routine inspections to ensure compliance with the approved stormwater management

and sediment and erosion control plans. Such inspections shall be performed at a time agreed upon with the landowner.

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Table 1. Stormwater Infrastructure Design Criteria

Design Criteria	Description										
Water Quality Volume (WQV)	$WQV = (P)(R_v)(A)$ P = 1 inch of rainfall R _v = unitless runoff coefficient, $R_v = 0.05 + 0.9(I)$ I = percent impervious cover draining to the structure converted to decimal form A = total site area draining to the structure										
Water Quality Flow (WQF)	$WQF = (q_u)(WQV)$ WQV = water quality volume calculated as noted above q _u = unit peak discharge from TR-55 exhibits 4-II and 4-III Variables needed for exhibits 4-II and 4-III: I _a = the initial abstraction = 0.2S S = potential maximum retention in inches = $(1000/CN) - 10$ CN = water quality depth curve number $= 1000 / (10 + 5P + 10Q - 10[Q^2 + 1.25(Q)(P)]^{0.5})$ P = 1 inch of rainfall Q = the water quality depth in inches = WQV/A A = total area draining to the design structure										
Groundwater Recharge Volume (GRV)	$GRV = (A_i)(R_d)$ A _i = the total area of effective impervious surfaces that will exist on the site after development R _d = the groundwater recharge depth based on the USDA/NRCS hydrologic soil group, as follows: <table border="1" data-bbox="568 1050 1006 1228"> <thead> <tr> <th>Hydrologic Group</th> <th>R_d (inches)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.40</td> </tr> <tr> <td>B</td> <td>0.25</td> </tr> <tr> <td>C</td> <td>0.10</td> </tr> <tr> <td>D</td> <td>0.00</td> </tr> </tbody> </table>	Hydrologic Group	R _d (inches)	A	0.40	B	0.25	C	0.10	D	0.00
Hydrologic Group	R _d (inches)										
A	0.40										
B	0.25										
C	0.10										
D	0.00										
Channel Protection Volume (CPV)	If the 2-year, 24-hour post-development storm volume <i>does not increase</i> due to development then: control the 2-year, 24-hour post-development peak flow rate to the 2-year, 24-hour predevelopment level. If the 2-year, 24-hour post-development storm volume <i>does increase</i> due to development then: control the 2-year, 24-hour post-development peak flow rate to ½ of the 2-year, 24-hour pre-development level or to the 1-year, 24-hour pre-development level.										
Peak Control	Post-development peak discharge rates shall not exceed pre-development peak discharge rates for the 10-year and 50-year, 24-hour storms										
EIC and UDC	$\%EIC = \text{area of effective impervious cover} / \text{total drainage areas within a project area} \times 100$ $\%UDC = \text{area of undisturbed cover} / \text{total drainage area within a project area} \times 100$										

[After: NH DES Stormwater Manual: Volume2 Post-Construction Best Management Practices Selection & Design (December 2008)]

Submitted by:

With editorial comments and revisions incorporated from Bill Arcieri (VHB), Steve Keach (Keach-Nordstrom), and Jennifer Rowden (RPC).

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