



SUBDIVISION REGULATIONS

6/16/2021

Stormwater Regulations Amendments

~~Language to be removed.~~

Language to be added

SECTION 10: DESIGN STANDARDS AND REQUIREMENTS FOR ROAD IMPROVEMENTS

10.01 GENERAL:

A. **Approval of Improvements:** All improvements shall be designed and constructed in accordance with the Town of Fremont regulations and standards, and shall be subject to the approval of the Board.

B. **Installation and Maintenance:** The Applicant is responsible for the satisfactory installation of all required improvements and maintenance of these improvements in a satisfactory condition without cost to the Town of Fremont until their acceptance by the Town of Fremont.

C. **Standards and Specifications:** The following standards and specifications shall include but not be limited to the following in the design and construction of all improvements:

1. ZONING ORDINANCE - Town of Fremont, current edition;
2. MANUAL ON DRAINAGE DESIGN FOR HIGHWAYS - State of New Hampshire,
Department of Public Works and Highways, current edition;

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3. MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) - U.S. Department of Transportation, Federal Highway Administration, current edition;
4. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION – State of New Hampshire, Department of Transportation, most current edition;
5. HIGHWAY DESIGN MANUAL - State of New Hampshire, Highway Design Division, most current edition;
6. A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS – AASHTO – Current edition;
- ~~7. STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL HANDBOOK FOR URBAN AND DEVELOPING AREAS IN NEW HAMPSHIRE Current edition, prepared by Rockingham County Conservation District (Green Book);~~
8. NH Department of Environmental Services Stormwater Manual: Volume2 Post-Construction Best Management Practices Selection & Design (December 2008)
9. Other standards and specifications as approved by the Town of Fremont.

10.03 STORM DRAIN SYSTEM: STORMWATER MANAGMENT

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 Fremont. 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.

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

89

90 **3. Definitions**

- 91 a. "Surface Waterbody" is defined, in accordance with RSA 485-A, as a perennial and
92 seasonal streams, lakes, ponds, and tidal waters within the jurisdiction of the state,
93 including all streams, lakes, or ponds bordering on the state, marshes, water courses, and
94 other bodies of water, natural or artificial.

95

96 **B: Minimum Thresholds for Applicability**

- 97
- 98 1. The Post-Construction Stormwater Management Standards apply to subdivisions that result in
99 creation of a private road or a road intended for adoption as a public road. All stormwater
100 runoff generated from the proposed private or public roadway(s) and any other stormwater
101 runoff contributing to the roadway stormwater management system(s) shall be managed and
102 treated in full compliance with these standards.
- 103
- 104 2. For subdivisions comprising lots with frontage on existing private or public roadways, roadside
105 drainage and any other stormwater runoff from the new lots discharging to the roadside
106 drainage system must be managed for: stormwater runoff quantity/volume; and water quality
107 treatment if stormwater is discharged to the municipality's drainage system subject to the EPA
108 MS4 permit.

109

110 **C: Stormwater Management for New Development**

- 111
- 112 1. All proposed stormwater management practices and treatment systems shall meet the
113 following performance standards.
- 114 a. Stormwater management and erosion and sediment control practices shall be located
115 outside any specified buffer zones unless otherwise approved by the Planning Board.
116 Alternatives to stream and wetland crossings that eliminate or minimize environmental
117 impacts shall be considered whenever possible.
- 118 b. Low Impact Development (LID) site planning and design strategies is encourage be used
119 to the maximum extent practicable (MEP to reduce stormwater runoff volumes, protect
120 water quality, and maintain predevelopment site hydrology. LID techniques have the

121 goals of protecting water quality, maintaining predevelopment site hydrology. LID
122 techniques that preserve existing vegetation, reduce the development footprint,
123 minimize or disconnect impervious area, and use enhanced stormwater best
124 management practices (BMPs) (such as raingardens, bioretention systems, tree box
125 filters, and similar stormwater management landscaping techniques) shall be
126 incorporated into landscaped areas. Capture and reuse of stormwater is strongly
127 encouraged. The applicant must document in writing why LID strategies are not
128 appropriate when not used to manage stormwater.

129 c. All stormwater treatment areas shall be planted with native plantings appropriate for
130 the site conditions: trees, grasses, shrubs and/or other native plants in sufficient
131 numbers and density to prevent soil erosion and to achieve the water quality treatment
132 requirements of this section.

133

134 d. Salt storage areas shall be fully covered with permanent or semi-permanent measures
135 and loading/offloading areas shall be located and designed to not drain directly to
136 receiving waters and maintained with good housekeeping measures in accordance with
137 NH DES published guidance. Runoff from snow and salt storage areas shall enter
138 treatment areas as specified above before being discharged to receiving waters or
139 allowed to infiltrate into the groundwater. See NHDES published guidance fact sheets on
140 road salt and water quality, and snow disposal at
141 <http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/index.htm>.

142 e. Surface runoff shall be directed into appropriate stormwater control measures designed
143 for treatment and/or filtration to the maximum extent practicable and/or captured and
144 reused onsite.

145 f. All newly generated stormwater from new development shall be treated on the
146 development site. A development plan shall include provisions to retain natural
147 predevelopment watershed areas on the site by using the natural flow patterns.

148 g. Runoff from impervious surfaces shall be treated to achieve at least 80% removal of Total
149 Suspended Solids and at least 50% removal of both total nitrogen and total phosphorus
150 using appropriate treatment measures, as specified in the NH Stormwater Manual.
151 Volumes 1 and 2, December 2008, as amended or other equivalent means. Where
152 practical, the use of natural, vegetated filtration and/or infiltration practices or subsurface
153 gravel wetlands for water quality treatment is preferred given its relatively high nitrogen
154 removal efficiency. All new impervious area draining to surface waters impaired by
155 nitrogen, phosphorus or nutrients shall be treated with stormwater BMP's designed to
156 optimize pollutant removal efficiencies based on design standards and performance data
157 published by the UNH Stormwater Center and/or included in the latest version of the NH
158 Stormwater Manual.

159 h. Measures shall be taken to control the post-development peak runoff rate so that it does
160 not exceed pre-development runoff. Drainage analyses shall include calculations
161 comparing pre- and post-development stormwater runoff rates (cubic feet/second) and
162 volumes (cubic feet) for the 1-inch rainstorm and the 2-year, 10-year, 25-year, and 50-
163 year 24-hour storm events. Similar measures shall be taken to control the post-

- 164 development runoff volume to infiltrate the groundwater recharge volume GR_v according
165 to the following ratios of Hydrologic Soil Group (HSG) type versus infiltration rate
166 multiplier: HSG-A: 0.4; HSG-B: 0.25; HSG-C: 0.1; HSG-D: 0.00. For sites where infiltration is
167 limited or not practicable, the applicant must demonstrate that the project will not create
168 or contribute to water quality impairment.
- 169 i. The design of the stormwater drainage systems shall provide for the disposal of
170 stormwater without flooding or functional impairment to streets, adjacent properties,
171 downstream properties, soils, or vegetation.
- 172 j. The design of the stormwater management systems shall account for upstream and
173 upgradient runoff that flows onto, over, or through the site to be developed or re-
174 developed, and provide for this contribution of runoff.
- 175 k. Whenever practicable, native site vegetation shall be retained, protected, or
176 supplemented. Any stripping of vegetation shall be done in a manner that minimizes soil
177 erosion.
- 178
- 179 **2. Submission Requirements for Stormwater Management Report and Plans.**
- 180 a. All applications shall include a comprehensive Stormwater Management Plan (SMP). The
181 SMP shall include a narrative description and an Existing Conditions Site Plan showing all
182 pre-development impervious surfaces, buildings and structures; surface water bodies and
183 wetlands; drainage patterns, sub-catchment and watershed boundaries; building setbacks
184 and buffers, locations of various hydrologic group soil types, mature vegetation, land
185 topographic contours with minimum 2-foot intervals and spot grades where necessary for
186 sites that are flat.
- 187 b. The SMP shall include a narrative description and a Proposed Conditions Site Plan
188 showing all post-development proposed impervious surfaces, buildings and structures;
189 temporary and permanent stormwater management elements and best management
190 practices (BMP), including BMP GIS coordinates and GIS files; important hydrologic
191 features created or preserved the site; drainage patterns, sub-catchment and watershed
192 boundaries; building setbacks and buffers; proposed tree clearing and topographic
193 contours with minimum 2-foot intervals. The plans shall provide calculations and
194 identification of the total area of disturbance proposed on the site (and off site if
195 applicable) and total area of new impervious surface created. **A summary of the drainage**
196 **analysis showing a comparison of the estimated peak flow and volumes for various**
197 **design storms (see Table 1. Stormwater Infrastructure Design Criteria) at each of the**
198 **outlet locations shall be included.**
- 199 c. The SMP shall describe the general approach and strategies implemented, and the facts
200 relied upon, to meet the goals of Element A and Element C.: The SWP shall include design
201 plans and/or graphical sketch(es) of all proposed above ground LID practices.
- 202 d. The SMP shall include calculations of the change in impervious area, pollution loading and
203 removal volumes for each best management practice, and GIS files containing the
204 coordinates of all stormwater infrastructure elements (e.g. catch basins, swales,
205 detention/bioretenention areas, piping).

- 206 e. The SMP shall include a description and a proposed Site Plan showing proposed erosion
207 and sediment control measures, limits of disturbance, temporary and permanent soil
208 stabilization measures in accordance with the NHDES Stormwater Manual Volume 3
209 (most recent version) as well as a construction site inspection plan including phased
210 installation of best management practices and final inspection upon completion of
211 construction.
- 212 f. The SMP shall include a long-term stormwater management BMP inspection and
213 maintenance plan (see Element E) that describes the responsible parties and contact
214 information for the qualified individuals who will perform future BMP inspections. The
215 inspection frequency, maintenance and reporting protocols shall be included.
- 216 g. The SMP shall describe and identify locations of any proposed deicing chemical and/or
217 snow storage areas. SMP will describe how deicing chemical use will be minimized or used
218 most efficiently.
- 219 h. In urbanized areas that are subject to the EPA MS4 Stormwater Permit and will drain to
220 chloride-impaired waters, any new developments and redevelopment projects shall
221 submit a description of measures that will be used to minimize salt usage, and track and
222 report amounts applied using the UNH Technology Transfer Center online tool
223 (<http://www.roadsalt.unh.edu/Salt/>) in accordance with Appendix H of the NH MS4
224 Permit.
- 225
- 226 1. **General Performance Criteria for Stormwater Management Plans.**
- 227 a. All applications shall apply site design practices to reduce the generation of stormwater in
228 the post-developed condition, reduce overall impervious surface coverage, seek
229 opportunities to capture and reuse and minimize and discharge of stormwater to the
230 municipal stormwater management system.
- 231 b. Water Quality Protection.
- 232 i. No stormwater runoff generated from new development or redevelopment shall be
233 discharged directly into a jurisdictional wetland or surface water body without
234 adequate treatment.
- 235 ii. All developments shall provide adequate management of stormwater runoff
236 and prevent discharge of stormwater runoff from creating or contributing to water
237 quality impairment.
- 238 c. Onsite groundwater recharge rates shall be maintained by promoting infiltration through
239 use of structural and non-structural methods. The annual recharge from the post
240 development site shall maintain or exceed the annual recharge from pre-development
241 site conditions. Capture and reuse of stormwater runoff is encouraged in instances where
242 groundwater recharge is limited by site conditions All stormwater management practices
243 shall be designed to convey stormwater to allow for maximum groundwater recharge.
244 This shall include, but not be limited to:
- 245 i. Maximizing flow paths from collection points to outflow points.
- 246 ii. Use of multiple BMPs.

- 247 iii. Retention of and discharge to fully vegetated areas.
- 248 iv. Maximizing use of infiltration practices.
- 249 v. Stormwater System Design Performance Standards.
- 250 d. Stormwater system design, performance standards and protection criteria shall be
- 251 provided as prescribed in Table 1 below. Calculations shall include sizing of all structures
- 252 and best management practices, including sizing of emergency overflow structures based
- 253 on assessment of the 100-year 24-hour frequency storm discharge rate.
- 254 e. The sizing and design of stormwater management practices shall utilize new precipitation
- 255 data from the Northeast Region Climate Center (NRCC) or the most recent precipitation
- 256 atlas published by the National Oceanic and Atmospheric Administration (NOAA) for the
- 257 sizing and design of all stormwater management practices. See the NRCC website at
- 258 <http://precip.eas.cornell.edu/>.
- 259 f. All stormwater management practices involving bioretention and vegetative cover as a
- 260 key functional component must have a landscaping plan detailing both the type and
- 261 quantities of plants and vegetation to be in used in the practice and how and who will
- 262 manage and maintain this vegetation. The use of native plantings appropriate for site
- 263 conditions is strongly encouraged for these types of stormwater treatment areas. The
- 264 landscaping plan must be prepared by a registered landscape architect, soil conservation
- 265 district office, or another qualified professional.
- 266
- 267 2. Spill Prevention, Control and Countermeasure (SPCC) Plan.
- 268 Any existing or otherwise permitted use or activity having regulated substances in amounts
- 269 greater than five gallons, shall submit to the local official such as Fire Chief, Emergency
- 270 Response Official a SPCC plan for review and approval. The Plan will include the following
- 271 elements:
- 272 a. Disclosure statements describing the types, quantities, and storage locations of all
- 273 regulated substances that will be part of the proposed use or activity.
- 274 b. Owner and spill response manager's contact information.
- 275 c. Location of all surface waters and drainage patterns.
- 276 d. A narrative describing the spill prevention practices to be employed when normally using
- 277 regulated substances.
- 278 e. Containment controls, both structural and non-structural.
- 279 f. Spill reporting procedures, including a list of municipal personnel or agencies that will be
- 280 contacted to assist in containing the spill, and the amount of a spill requiring outside
- 281 assistance and response.
- 282 g. Name of a contractor available to assist in spill response, contaminant, and cleanup.
- 283 h. The list of available clean-up equipment with instructions available for use on-site and the
- 284 names of employees with adequate training to implement containment and clean up
- 285 response.
- 286

287 **D: Stormwater Management for Redevelopment**

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- 288
- 289 1. Redevelopment (as applicable to this stormwater regulation) means:
- 290 a. Any construction, alteration, or improvement that disturbs existing impervious area
- 291 (including demolition and removal of road/parking lot materials down to the erodible
- 292 subbase) or expands existing impervious cover by any amount, where the existing land
- 293 use is commercial, industrial, institutional, governmental, recreational, or multifamily
- 294 residential.
- 295 b. Any redevelopment activity that results in improvements with no increase in impervious
- 296 area shall be considered redevelopment activity under this regulation if capital cost of
- 297 improvements is greater than 30% of the appraised property value.
- 298 c. Any new impervious area over portions of a site that are currently pervious.
- 299 d. The following activities are not considered redevelopment:
- 300 ▪ Interior and exterior building renovation.
- 301 ▪ Resurfacing of an existing paved surface (e.g. parking lot, walkway or roadway).
- 302 ▪ Pavement excavation and patching that is incidental to the primary project purpose,
- 303 such as replacement of a collapsed storm drain.
- 304 ▪ Landscaping installation and maintenance.
- 305 2. Redevelopment applications shall comply with the requirements of Sections C.2 Submission
- 306 **Requirements for Stormwater Management Report and Plans, C.3 General Performance**
- 307 **Criteria for Stormwater Management Plans, and C.4 Spill Prevention, Control and**
- 308 **Countermeasure (SPCC) Plan.**
- 309 3. For sites meeting the definition of a redevelopment project and having less than 60% existing
- 310 impervious surface coverage, the stormwater management requirements will be the same as
- 311 other new development projects. The applicant must satisfactorily demonstrate that
- 312 impervious area is minimized, and LID practices have been implemented on-site to the MEP..
- 313 4. For sites meeting the definition of a redevelopment project and having more than 60%
- 314 existing impervious surface area, stormwater shall be managed for water quality in
- 315 accordance with one or more of the following techniques, listed in order of preference:
- 316 a. Implement measures onsite that result in disconnection or treatment of 100% of the
- 317 additional proposed impervious surface area and at least 30% of the existing impervious
- 318 area and pavement areas, preferably using filtration and/or infiltration practices.
- 319 b. If resulting in greater overall water quality improvement on the site, implement LID
- 320 practices to the MEP to provide treatment of runoff generated from at least 60% of the
- 321 entire developed site area.
- 322 3. Runoff from impervious surfaces shall be treated to achieve at least 80% removal of Total
- 323 Suspended Solids and at least 50% removal of both total nitrogen and total phosphorus using
- 324 appropriate treatment measures, as specified in the NH Stormwater Manual. Volumes 1 and
- 325 2, December 2008, as amended or other equivalent means. All new impervious area draining
- 326 to surface waters impaired by nitrogen, phosphorus or nutrients shall be treated with
- 327 stormwater BMP's designed to optimize pollutant removal efficiencies based on design
- 328 standards and performance data published by the UNH Stormwater Center and/or included in
- 329 the latest version of the NH Stormwater Manual.

- 330 4. Off – site mitigation allowance: In cases where the applicant demonstrates, to the
331 satisfaction of the Planning Board, that on-site treatment has been implemented to the MEP
332 or is not feasible, off-site mitigation will be an acceptable alternative if implemented within
333 the same subwatershed, within the project’s drainage area or within the drainage area of the
334 receiving water body. To comply with local watershed objectives the mitigation site would be
335 preferably situated in the same subwatershed as the development and impact/benefit the
336 same receiving water. Off-site mitigation shall only be approved by the Planning Board with
337 the following conditions:
- 338 a. The Conservation Commission has been given the opportunity to advise the
339 Planning Board regarding the proposed off-site mitigation.
- 340 b. The off-site mitigation shall be equivalent to no less than the total area of
341 impervious cover NOT treated on-site. Treatment of the impervious area shall
342 comply with all standards of this regulation.
- 343 c. An approved off-site location must be identified, the specific management
344 measures identified, and if not owned by the applicant, with a written agreement
345 with the property owner(s) and an implementation schedule developed in
346 accordance with planning board review. The applicant must also demonstrate
347 that there is no downstream drainage or flooding impacts that would result from
348 not providing on-site management for large storm events.

349

350 **E: Stormwater Management Plan and Site Inspections**

351

- 352 1. The applicant shall provide that all stormwater management and treatment practices have an
353 enforceable operations and maintenance plan and agreement to ensure the system functions
354 as designed. This agreement will include all maintenance easements required to access and
355 inspect the stormwater treatment practices, and to perform routine maintenance as
356 necessary to ensure proper functioning of the stormwater system. The operations and
357 maintenance plan shall specify the parties responsible for the proper maintenance of all
358 stormwater treatment practices. The operations and maintenance shall be provided to the
359 Planning Board as part of the application prior to issuance of any local permits for land
360 disturbance and construction activities.
- 361
- 362 2. The applicant shall provide legally binding documents for filing with the Registry of Deeds
363 which demonstrate that the obligation for maintenance of stormwater best management
364 practices and infrastructure runs with the land and that the Town has legal access to inspect
365 the property to ensure their proper function or maintain onsite stormwater infrastructure
366 when necessary to address emergency situations or conditions.
- 367
- 368 3. The property owner shall bear responsibility for the installation, construction, inspection, and
369 maintenance of all stormwater management and erosion control measures required by the
370 provisions of these regulations and as approved by the Planning Board, including emergency
371 repairs completed by the Town.
- 372

373 **F. Stormwater Management Plan Recordation**

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375 1. Stormwater management and sediment and erosion control plans shall be incorporated as
376 part of any approved site plan. A Notice of Decision acknowledging the Planning Board
377 approval of these plans shall be recorded at the Registry of Deeds. The Notice of Decision
378 shall be referenced to the property deed (title/book/page number) and apply to all persons
379 that may acquire any property subject to the approved stormwater management and
380 sediment control plans. The Notice of Decision shall reference the requirements for
381 maintenance pursuant to the stormwater management and erosion and sediment control
382 plans as approved by the Planning Board.

383

384 2. The applicant shall submit as-built drawings of the constructed stormwater management
385 system following construction.

386

387 3. Easements:

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

394

395 **G. Inspection and Maintenance Responsibility**

396

397 1. Select Board or their designated agent shall have site access to complete inspections to
398 ensure compliance with the approved stormwater management and sediment and erosion
399 control plans. Such inspections shall be performed at a time agreed upon with the landowner.

400 a. If permission to inspect is denied by the landowner, municipal staff or their
401 designated agent shall secure an administrative inspection warrant from the district
402 or superior court under RSA 595-B Administrative Inspection Warrants. Expenses
403 associated with inspections shall be the responsibility of the applicant/property
404 owner.

405 b. If violations or non-compliance with a condition(s) of approval are found on the site
406 during routine inspections, the inspector shall provide a report to the Planning Board
407 documenting these violations or non-compliance including recommend corrective
408 actions. The Planning Board shall notify the property owner in writing of these
409 violations or non-compliance and corrective actions necessary to bring the property
410 into full compliance. The Planning Board, at their discretion, may recommend to the
411 Select Board to issue a stop work order if corrective actions are not completed within
412 10 days.

413 c. If corrective actions are not completed within a period of 30 days from the Planning
414 Board or Board notification, the Planning Board may exercise their jurisdiction under
415 RSA 676:4-a Revocation of Recorded Approval.

416

417 2. The applicant shall bear final responsibility for the installation, construction, inspection, and
418 disposition of all stormwater management and erosion control measures required by the

419 Planning Board. Site development shall not begin before the Stormwater Management Plan
 420 receives written approval by the Planning Board.

421
 422 3. In the event a property owner refuses to repair infrastructure that is damaged or is not
 423 functioning properly, the Town retains the right but not the obligation and accepts no
 424 responsibility, to repair or maintain stormwater infrastructure if a property is abandoned or
 425 becomes vacant.

426
 427 4. Landowners shall be responsible for submitting an annual report to the Planning Board by
 428 September 1 every three years, with the first report due within three years of the receipt of
 429 an Occupancy Permit. The report shall be signed and stamped by a qualified professional
 430 engineer of the landowner's choice that all stormwater management and erosion control
 431 measures are functioning per the approved stormwater management plan. The report shall
 432 note if any stormwater infrastructure has needed any repairs other than routine maintenance
 433 and the results of those repairs. If the stormwater infrastructure is not functioning per the
 434 approved stormwater management plan the landowner shall report on the malfunction in
 435 their report and include detail regarding when the infrastructure shall be repaired and
 436 functioning as approved.

437
 438 If no report is filed by September 1 in the year the report is due, the Select Board or their
 439 designated agent shall have site access to complete routine inspections to ensure compliance
 440 with the approved stormwater management and sediment and erosion control plans. Such
 441 inspections shall be performed at a time agreed upon with the landowner.

442
 443
 444 **Table 1. Stormwater Infrastructure Design Criteria**

<u>Design Criteria</u>	<u>Description</u>
<u>Water Quality Volume (WQV)</u>	$WQV = (P)(R_v)(A)$ <u>P = 1 inch of rainfall</u> <u>R_v = unitless runoff coefficient, R_v = 0.05 + 0.9(I)</u> <u>I = percent impervious cover draining to the structure converted to decimal form</u> <u>A = total site area draining to the structure</u>
<u>Water Quality Flow (WQF)</u>	$WQF = (q_u)(WQV)$ <u>WQV = water quality volume calculated as noted above</u> <u>q_u = unit peak discharge from TR-55 exhibits 4-II and 4-III</u> <u>Variables needed for exhibits 4-II and 4-III:</u> <u>I_a = the initial abstraction = 0.2S</u> <u>S = potential maximum retention in inches = (1000/CN) - 10</u> <u>CN = water quality depth curve number</u> <u>= 1000/(10+5P+10Q-10[Q²+1.25(Q)(P)]^{0.5})</u> <u>P = 1 inch of rainfall</u> <u>Q = the water quality depth in inches = WQV/A</u> <u>A = total area draining to the design structure</u>

<u>Groundwater Recharge Volume (GRV)</u>	$GRV = (A_i)(R_d)$ <u>A_i = the total area of effective impervious surfaces that will exist on the site after development</u> <u>R_d = the groundwater recharge depth based on the USDA/NRCS hydrologic soil group, as follows:</u> <table> <tr> <td><u>Hydrologic Group</u></td><td><u>R_d (inches)</u></td></tr> <tr> <td><u>A</u></td><td><u>0.40</u></td></tr> <tr> <td><u>B</u></td><td><u>0.25</u></td></tr> <tr> <td><u>C</u></td><td><u>0.10</u></td></tr> <tr> <td><u>D</u></td><td><u>0.00</u></td></tr> </table>	<u>Hydrologic Group</u>	<u>R_d (inches)</u>	<u>A</u>	<u>0.40</u>	<u>B</u>	<u>0.25</u>	<u>C</u>	<u>0.10</u>	<u>D</u>	<u>0.00</u>
<u>Hydrologic Group</u>	<u>R_d (inches)</u>										
<u>A</u>	<u>0.40</u>										
<u>B</u>	<u>0.25</u>										
<u>C</u>	<u>0.10</u>										
<u>D</u>	<u>0.00</u>										
<u>Channel Protection Volume (CPV)</u>	<u>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.</u> <u>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.</u>										
<u>Peak Control</u>	<u>Post-development peak discharge rates shall not exceed pre-development peak discharge rates for the 10-year and 50-year, 24-hour storms</u>										
<u>EIC and UDC</u>	<u>%EIC = area of effective impervious cover/total drainage areas within a project area x 100</u> <u>%UDC = area of undisturbed cover/total drainage area within a project area x 100</u>										

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

455

456 1. ~~The proposed development shall provide for proper surface drainage so that~~
457 ~~removal of surface waters will not adversely affect neighboring properties or the~~
458 ~~public storm water system and will help reduce flooding, erosion, and~~
459 ~~sedimentation.~~

460

461 2. ~~The drainage system shall be designed so that the post development runoff rate~~
462 ~~does not exceed the pre development runoff rate. Surface water runoff shall be~~
463 ~~controlled and directed in a system of catch basins, pipes, swales, drainage ways,~~
464 ~~culverts, or channels to a natural watercourse or existing drainage facilities.~~

465

466 3. ~~Where a subdivision is traversed by a watercourse, drainage way, channel, or~~
467 ~~stream, there shall be provided an easement conforming to the lines of such~~
468 ~~watercourse. When a proposed drainage system will result in water encroaching~~
469 ~~on land outside the subdivision, appropriate drainage rights must be secured and~~
470 ~~indicated on the plan.~~

471

472 4. ~~Where the Road Agent determines that the existing downstream, offsite drainage~~
473 ~~system is substandard, the Planning Board may require the Applicant to improve~~
474 ~~the existing drainage system.~~

475

476 B. **Design Computations:** ~~A drainage study/storm water management report shall be~~
477 ~~submitted for review and shall include:~~

478

479 1. ~~A table of contents;~~

480

481 2. ~~A narrative statement that indicates how the Applicant has met the requirements of~~
482 ~~Section 12.03 A and describes the methodology and results of analyses;~~

483

484 3. ~~A summary table comparing existing and post development rates of runoff for~~
485 ~~each individual drainage basin/watershed to abutting properties. All watersheds~~
486 ~~and drainage areas shall be consistently labeled in the tables, calculations, and~~
487 ~~plans;~~

488

489 4. ~~A summary table of each pipe indicating project location, pipe size, type, length,~~
490 ~~slope, Manning's "n" value, peak discharge, depth of flow, and peak velocity for~~
491 ~~the design storm. The summary table shall also include hydraulic grade line~~
492 ~~(HGL) elevations at each location in closed conduit piping systems;~~

493

494 5. ~~A summary table of each swale and channel indicating project location, cross-~~
495 ~~section/channel width, slope, Manning's "n" value, peak discharge, depth of flow,~~
496 ~~and peak velocity for the design storm;~~

497

498 6. ~~The project location and watershed area shown on USGS quadrangle as a figure in~~
499 ~~the report;~~

500

- 501 7. ~~A watershed area plan for existing condition showing topography and existing~~
502 ~~ground elevations at two (2) foot contour intervals for the project site. The plan~~
503 ~~shall clearly show the boundary of each drainage area and sub area with~~
504 ~~identifying label and the size indicated in acres;~~
505
- 506 8. ~~A watershed area plan for post development conditions showing existing and~~
507 ~~proposed topography at two (2) foot contour intervals for the project site. The plan~~
508 ~~shall clearly show the boundary of each drainage area and sub area with~~
509 ~~identifying label and the size indicated in acres. The post development area shall~~
510 ~~be shown on a separate plan from the existing condition;~~
511 9. ~~Runoff calculations shall be completed for the existing and post development~~
512 ~~conditions using Soil Conservation Service (SCS) methods as described in the~~
513 ~~Storm water Management and Erosion and Sediment Control Handbook for Urban~~
514 ~~and Developing Areas in New Hampshire for the appropriate design storms as~~
515 ~~required by the regulations;~~
516
- 517 10. ~~Flood routing calculations shall be provided for the design of each detention basin~~
518 ~~and pond using acceptable methods or as may be approved by the Town Engineer.~~
519 ~~In addition to the design storm, a fifty (50) year storm analysis shall be conducted~~
520 ~~to establish the fifty (50) year elevation at the detention basin. A minimum of~~
521 ~~twelve (12) inches of free board shall be provided above the fifty (50) year storm~~
522 ~~to the minimum elevation of embankment at the detention basin;~~
523
- 524 11. ~~Water quality treatment facilities shall be designed to New Hampshire Department~~
525 ~~of Environmental Services standards and are in addition to the requirements of~~
526 ~~these regulations;~~
527
- 528 12. ~~Riprap design calculations shall be provided to the requirements of the Storm~~
529 ~~Water Management and Erosion and Sediment Control Handbook for Urban and~~
530 ~~Developing Areas in New Hampshire for each pipe discharge location and where~~
531 ~~necessary for open channels and swales; and~~
532
- 533 13. ~~A licensed professional engineer in the State of New Hampshire shall stamp the~~
534 ~~report.~~
535
- 536 ~~C. **Flow Computations:** Flow computations shall be in accordance with the following:~~
537
- 538 1. ~~Manning's formula shall be used to compute capacities for all open channels,~~
539 ~~swales, and closed piping drainage systems; and~~
540
- 541 2. ~~The capacity of cross culverts shall be computed in accordance with Manual on~~
542 ~~Drainage Design for Highways New Hampshire Department of Transportation.~~
543
- 544 ~~D. **Design Runoff:** The rainfall frequency to be used for calculations shall be as follows:~~
545
- 546 1. ~~Residential areas: twenty five (25) years;~~
547 2. ~~Commercial areas: twenty five (25) years;~~

- 548 3. ——— Industrial areas: twenty five (25) years; and
549 4. ——— Flood protection works: fifty (50) years.
- 550
551 ~~E. ——— **Placement of Drain Lines:** All off site drain lines shall be placed within right of way~~
552 ~~dedicated for public street unless use of easements is specifically approved by the Board.~~
- 553
554 ~~F. ——— **Pipe Size, Velocity and Type:**~~
555
556 1. ——— Minimum allowable pipe diameter in any storm drain system shall be fifteen (15)
557 inches;
558
559 2. ——— The minimum design velocity in pipes shall be two (2) feet per second and the
560 maximum velocity shall be ten (10) feet per second;
561
562 3. ——— The minimum depth of cover for storm drain lines shall be thirty six (36) inches
563 from the top of pipe to finished grade;
564
565 4. ——— Pipe bedding material shall be three quarter (3/4) inch crushed stone. Bedding
566 shall be a minimum six (6) inch depth in earth and twelve (12) inch depth in ledge;
567 and
568
569 5. ——— Acceptable pipe material shall be Class IV reinforced concrete pipe (RCP) or
570 High Density Polyethylene (HDPE) pipe.
571
572 6. ——— Maximum length between drain manholes and catch basins shall be three hundred
573 (300) feet.
- 574
575 ~~G. ——— **Drainage structures:** Manholes and other drainage structures shall be pre-cast concrete~~
576 ~~meeting H 20 loading and constructed and installed in accordance with New Hampshire~~
577 ~~Department of Transportation Standards and Specifications for Road and Bridge~~
578 ~~Construction. Drainage structures shall not exceed eighteen (18) feet in depth (rim to~~
579 ~~bottom of structure).~~
- 580
581 ~~H. ——— **Driveway Culverts:** The location, length, size, bedding, and backfill of all driveway~~
582 ~~culverts shall be approved by the Road Agent prior to construction.~~